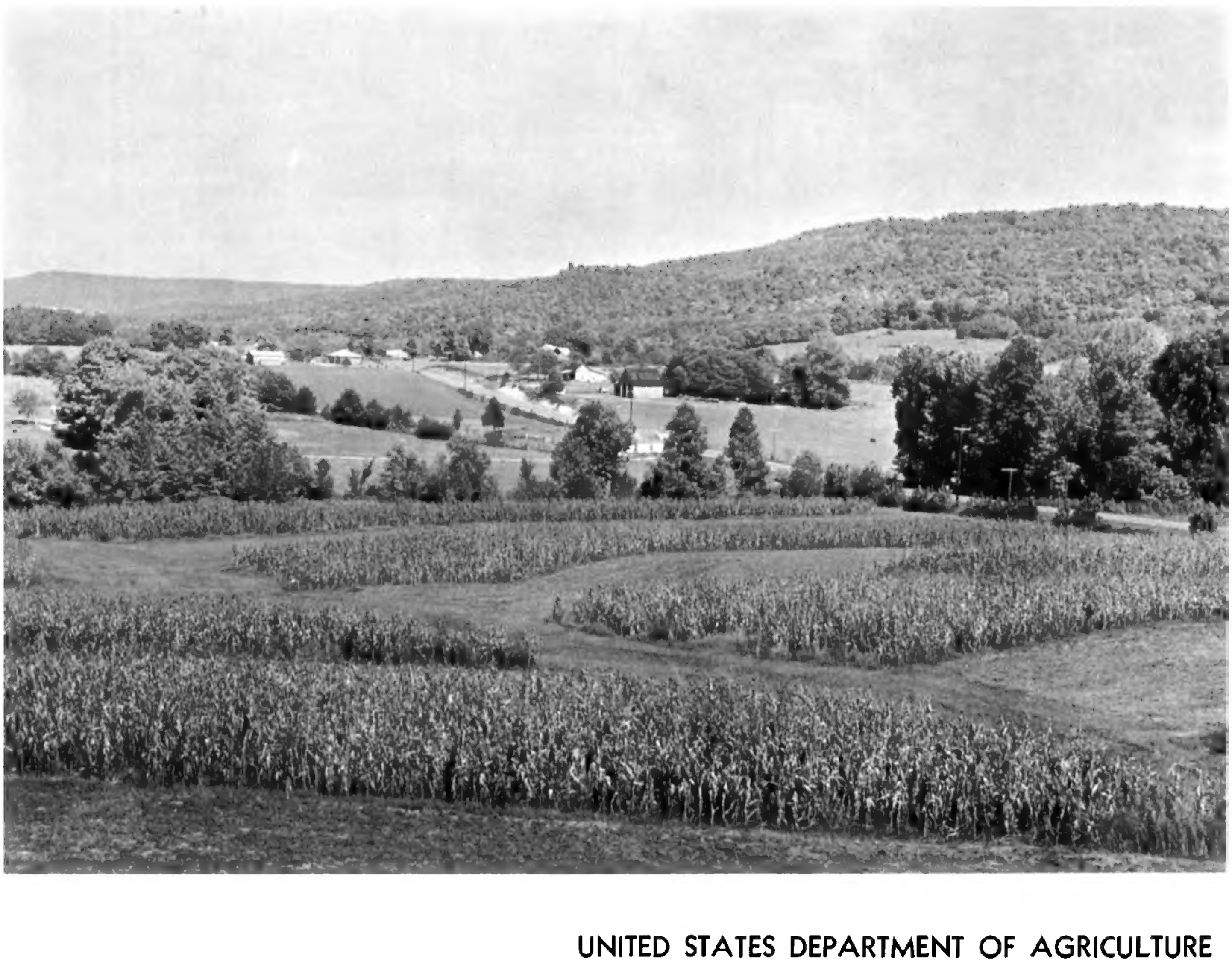
SOIL SURVEY
Warren County, Tennessee



UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
TENNESSEE AGRICULTURAL EXPERIMENT STATION

Major fieldwork for this soil survey was done in the period 1961–1963. Soil names and descriptions were approved in 1965. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1963. This survey of Warren County was made as part of the technical assistance furnished by the Soil Conservation Service to the Warren Soil Conservation District.

HOW TO USE THIS SOIL SURVEY REPORT

THIS SOIL SURVEY of Warren County, Tenn., contains information that can be applied in managing farms, ranches, and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in appraising the value of tracts of land for agriculture, industry, or recreation.

Locating soils

All the soils of Warren County are shown on the detailed map at the back of this report. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with numbers shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and using information

The "Guide to Mapping Units" can be used to find information in the report. This guide lists all of the soils of the county in alphabetic order by map symbol. It shows the page where each kind of soil is described, and also the page for the capability unit and woodland suitability group in which the soil has been placed.

Individual colored maps showing the relative suitability or limitations of soils for many specific purposes can be developed by using the soil map and information in the text. Interpretations not included in the text can be developed by grouping the soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils in the section describing the soils and in the section that discusses management of soils for crops and pasture.

Foresters and others can refer to the section "Woodland," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others concerned with wildlife will find information about soils and wildlife in the section "Managing Soils for Wildlife and Fish."

Engineers and builders will find in the section "Engineering," tables that give the engineering characteristics of the soils in the county that affect their use for roads and other structures.

Scientists and others can read about how the soils were formed and how they are classified in the section "Formation, Classification, and Morphology of Soils."

Students, teachers, and others will find information about soils and their management in various parts of the text, depending on their particular interest.

Newcomers in Warren County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the County," which gives additional information about the county.

Cover picture: Stripcropping in foreground is on Waynesboro and Cumberland soils. Wooded ridge in background consists of Rock land and Stony colluvial land.

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Contents

NOTICE TO LIBRARIANS

Series year and series number are no longer shown on soil surveys. See explanation on the next page.

Issued September 1967

EXPLANATION

Series Year and Series Number

Series year and number were dropped from all soil surveys sent to the printer after December 31, 1965. Many surveys, however, were then at such advanced stage of printing that it was not feasible to remove series year and number. Consequently, the last issues bearing series year and number will be as follows:

- Series 1957, No. 23, Las Vegas-Eldorado Area, Nev.
- Series 1958, No. 34, Grand Traverse County, Mich.
- Series 1959, No. 42, Judith Basin Area, Mont.
- Series 1960, No. 31, Elbert County, Colo. (Eastern Part)
- Series 1961, No. 42, Camden County, N.J.
- Series 1962, No. 13, Chicot County, Ark.
- Series 1963, No. 1, Tippah County, Miss.

Series numbers will be consecutive in each series year, up to and including the numbers shown in the foregoing list. The soil survey for Tippah County, Miss., will be the last to have a series year and series number.

SOIL SURVEY OF WARREN COUNTY, TENNESSEE

BY GEORGE T. JACKSON, SAMUEL R. BACON, JAMES F. BRASFIELD, DONALD B. FREEMAN, AND IVAL D. PERSINGER, SOIL CONSERVATION SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE

UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH THE TENNESSEE AGRICULTURAL EXPERIMENT STATION

WARREN COUNTY is in the central part of Tennessee (fig. 1). It is almost circular, is about 22 miles across, and has a total land area of 287,880 acres, or about 450 square miles. The southeastern third of the county is in the Cumberland Mountains, and the western two-thirds is on the Highland Rim. The elevation ranges from less than 800 feet, along the Caney Fork River, to

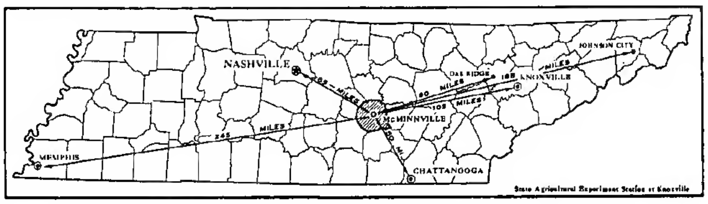

Figure 1.—**Location of Warren County in Tennessee.**

about 2,000 feet, at the top of the Cumberland Mountains.

Part of the Highland Rim in this county is known locally as the red soil area and makes up roughly the central third of the county. This part has deep, largely well-drained, reddish soils that are productive if they are well fertilized. The western third of the county, also a part of the Highland Rim, has light-colored, silty soils in the gently rolling areas and clayey and cherty soils on the steeper hillsides. On the Cumberland Plateau in the southeastern third of the county are light-colored soils that, if heavily fertilized, could produce favorable yields of many crops. However, the plateau and its steep, rocky hillsides are practically all forested.

How This Soil Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Warren County, where they are located, and how they can be used.

They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug or bored many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends vertically from the surface down into the parent material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. To use this report efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different textures in the surface layer, the major horizons of all the soils in one series are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Sequatchie, for example, is the name of a soil series. All the soils in the United States having the same series name are alike in those characteristics that go with their behavior in the natural, untouched landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that are alike except for texture of their surface layer. According to this difference in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Waynesboro loam and Waynesboro clay loam are two soil types in the Waynesboro series. The difference in texture of their surface layers is apparent from their names.

Some soil types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into soil phases. The name of a soil phase indicates a feature that affects management. For example, Cumberland silt loam, 2 to 5 percent slopes, is one phase of Cumberland silt loam, a soil type that ranges from nearly level to moderately steep.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that greatly help in drawing boundaries accurately. The soil map in the back of this report was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where small tracts of different kinds of soils are so intricately mixed that it is not practical to show them separately on the map. Therefore, they show this mixture of soils as one mapping unit and call it a soil complex. Ordinarily, a soil complex is named for the major soils in it, for example, Ramsey-Jefferson stony complex. Also, on most soil maps, areas are shown that are so rocky, so shallow, or so frequently worked by water that they scarcely can be called soils. These areas are shown on a soil map like other mapping units, but they are given descriptive names, such as Gullied land or Rock land, and are called land types rather than soils.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in a way that it is readily useful to different groups of readers, among them farmers, ranchers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in the soil survey reports. On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. Then, the scientists adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this soil survey shows, in color, the soil associations in Warren County, Tenn. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who what a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in

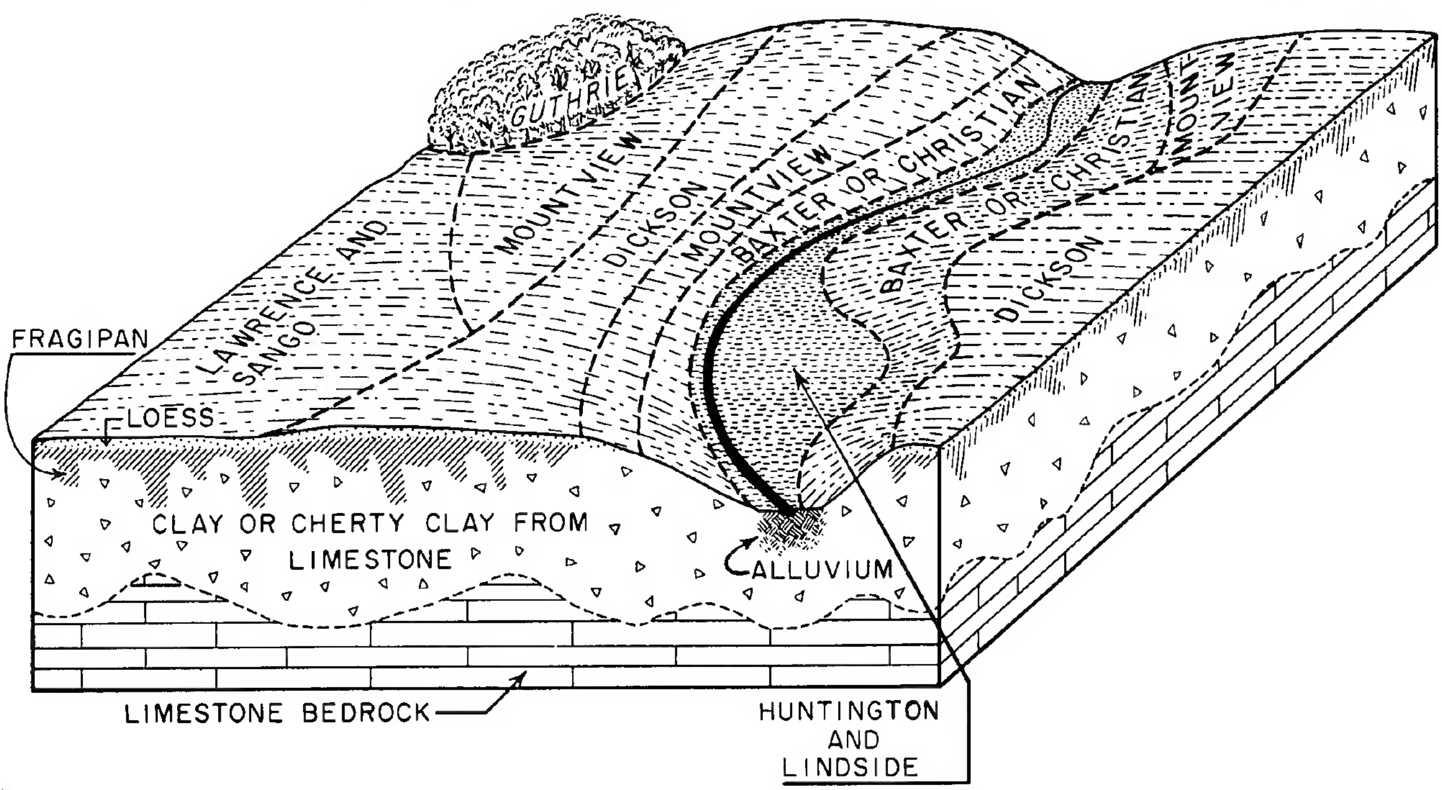

Figure 2.—**Major and minor soils and underlying parent material in the Dickson-Mountview association.**

slope, depth, stoniness, drainage, and other characteristics that affect management.

The general soil map of Warren County shows five soil associations. Associations 1 and 2 are part of the Highland Rim and make up the western third of the county. Soil association 3—known locally as the red soil area—also is a part of the Highland Rim and extends roughly through the center of the county. Soil associations 4 and 5 are on the Cumberland Plateau and its steep escarpments.

1. Dickson-Mountview association: Light-colored, silty soils on gently rolling hills and flats

Broad upland flats, gently rolling hills, and short crooked drainageways form the general pattern of this soil association (fig. 2). In a few places there are shallow basins. The upland flats, which rise 10 to 30 feet above the drainageways and basins, commonly are large enough to be farmed in fields 5 to 10 acres in size. The shallow basins ordinarily include a flat area of 2 to 10 acres that often is ponded by a few inches of water in winter and spring. Nearly everywhere are short slopes or hillsides that flank the drainageways and surround the basins.

The soils are mainly light colored and silty. Most of them formed in 2 to 3 feet of silty material, or loess, underlain by red cherty clay. On some of the short hillsides, however, there are reddish, clayey soils that formed in material weathered from limestone.

The Dickson soils make up about 40 percent of the association and occupy most of the upland flats and foot slopes. They are moderately well drained, light-colored, silty soils that have a compact layer, or fragipan, at a depth of about 24 inches. The Mountview soils make up about 20 percent of the association and are similar to the Dickson soils, but they are well drained and do not have a fragipan.

Figure 3.—**Pasture in the Dickson-Mountview association.**

Small areas of other soils occupy about 40 percent of the association. In the lowest, flattest areas are the Sango, Lawrence, and Guthrie soils. Except for their lighter color, the Sango soils are similar to the Dickson soils. The Lawrence and Guthrie soils are gray and are poorly or very poorly drained. On some of the steeper slopes are the Baxter and Christian soils. The Baxter soils are reddish and have a cherty clay subsoil. The Christian soils are similar to them but are not cherty.

About 80 percent of the association is cleared, and the rest is in small woodlots. The average farm is about 65 acres in size. A large acreage is pastured (fig. 3), and small acreages are used for small grain, corn, tobacco, and hay. The main farming enterprises are raising beef cattle and dairying. On many farms a small acreage is in burley tobacco.

The soils in this association are fairly suitable for farming. They are strongly acid and are low in natural fertility, but they respond well to management. Little of the acreage is steep, and nearly all of it can be used for pasture or for crops grown in suitable rotations. The main problems in managing the soils are low fertility, erosion on the slopes, and excess water in the low areas.

2. Baxter-Mountview association: Clayey and silty soils on rolling hills

Rolling hills with broad tops and short side slopes make up most of this soil association (fig. 4). Short, crooked drainageways are common, and there are a few shallow basins that have no outlet and are wet in winter and spring. Along the many meandering streams are strips of bottom land that range from only a few feet to 300 feet in width.

Dominant in this association are light-colored, silty soils on the hilltops and the foot slopes, in the gently rolling areas, and in the basins. These soils formed in loess, or windblown material. Reddish, cherty and clayey soils occupy the short hillsides.

The Baxter and Christian soils amount to about 60 percent of the association and are on the steeper slopes where a mantle of loess is missing. The Baxter soils formed in material weathered from limestone. They have a surface layer of brown cherty silt loam and a subsoil of red cherty clay. The Christian soils are similar to the Baxter soils, but they are only a little cherty and formed from siltstone instead of limestone.

The Mountview and Dickson soils make up about 35 percent of the association and occur on the mildly sloping uplands and on foot slopes. Both kinds of soil are light colored and silty, but Mountview soils are well drained, whereas the Dickson soils have a pan layer about 24 inches below the surface that restricts the movement of water.

Also in the association are small acreages of other soils. In the few shallow basins are the gray Guthrie soils and the mottled yellow and gray Lawrence soils. On narrow bottom lands along streams are the brown, fertile Huntington and Lindside soils.

About 80 percent of the association has been cleared. The only areas still wooded are small woodlots on farms and hills too steep for cultivation.

Although dairying is the principal occupation on a few farms, growing field crops and raising beef cattle are the main farming enterprises on this association. Many farms have a small acreage in tobacco. Because the relief is broken and slopes commonly are strong, most areas suitable

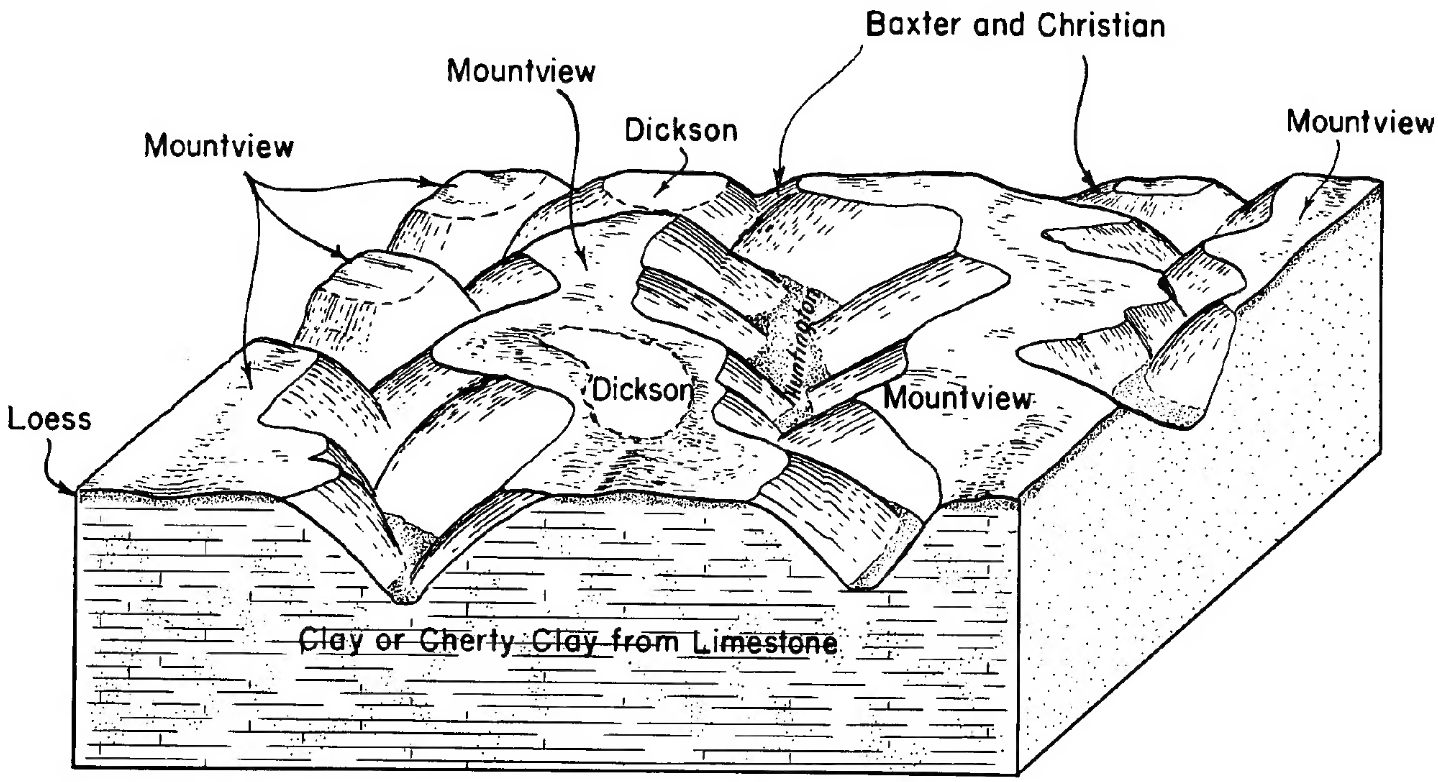

Figure 4.—Major and minor soils and underlying parent materials in the Baxter-Mountview association.

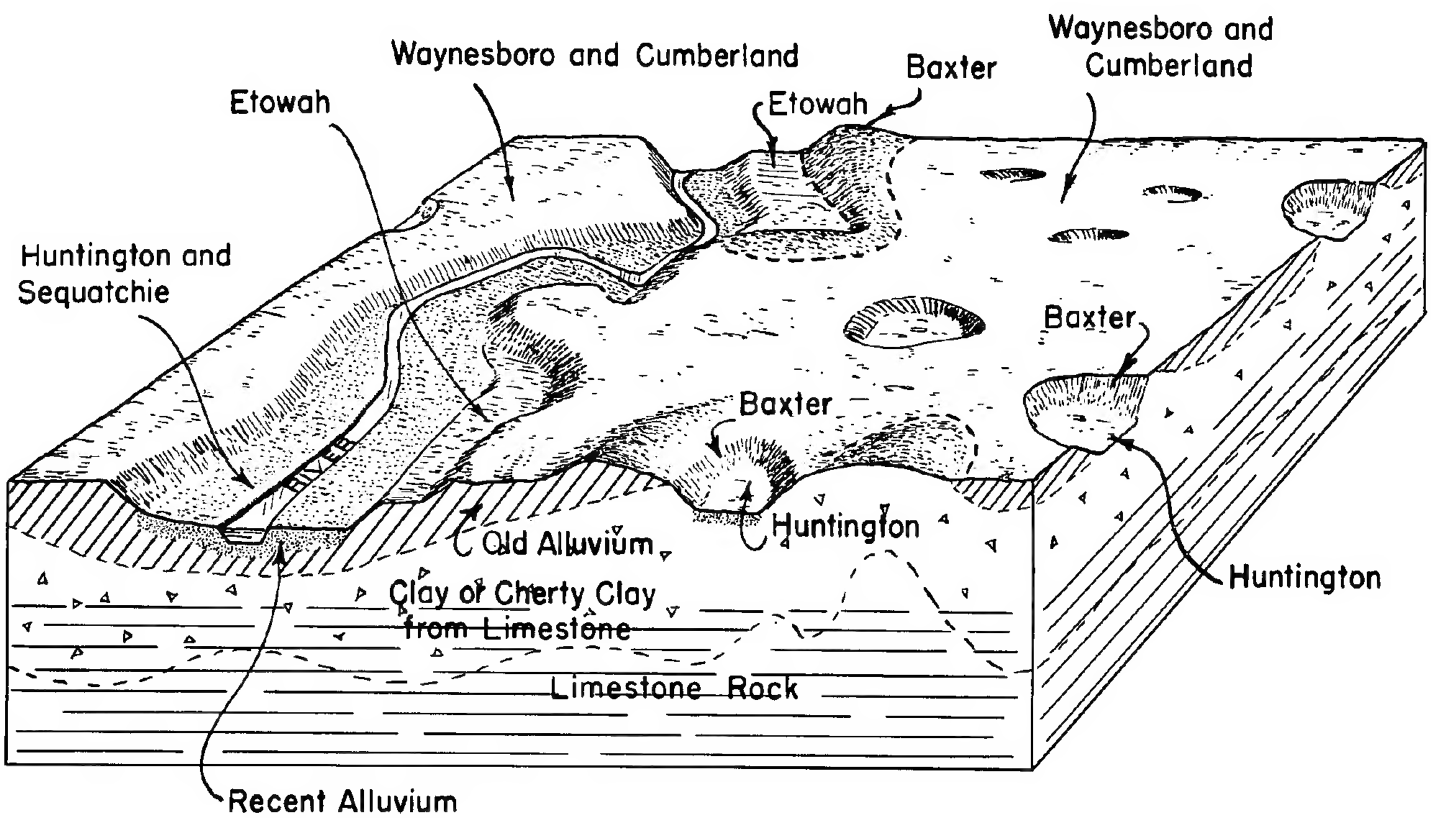

Figure 5.—Major and minor soils and underlying parent materials in the Waynesboro-Cumberland association.

for row cropping are smaller than 10 acres in size. Throughout the association, however, larger areas are suitable for pasturing. The soils on uplands are not fertile, and they must be heavily fertilized if good yields of crops and pasture are to be obtained. Generally, the association is most suitable for farming of a type that requires large areas of pasture and only a small acreage of row crops.

3. Waynesboro-Cumberland association: Red, clayey and loamy soils on terraces

This soil association is on the Highland Rim; it lies roughly in a southwest-northeast direction across the central part of the county (fig. 5). The eastern edge lies at the foot of the Cumberland Plateau escarpment and fingers deeply into mountain coves. From the foot of the escarpment, the association extends westward 4 to 8 miles. In most places it is gently rolling or rolling, but there are a few areas of steep, choppy hills. In places the surface is pitted by oval and irregularly shaped sinkholes and depressions. Throughout the association are many rivers, creeks, and small streams. Most of the streams rise in the mountains and follow a crooked, meandering course.

The soils of the association are locally called red land. About 70 percent of the total acreage consists of Waynesboro and Cumberland soils, all of which are very deep over bedrock and occupy the smooth, undulating hilltops and mild side slopes. The Cumberland soils have a reddish-brown surface layer and a dark-red subsoil, whereas the Waynesboro soils have a brown surface layer and a red subsoil. Both kinds of soils formed in old sediments that washed down from the Cumberland Plateau.

Minor soils make up about 30 percent of the association. The Baxter soils are cherty, clayey soils that formed from cherty limestone on uplands; they occupy the sides of deep sinkholes and the steeper slopes and hillsides adjoining bottom lands. The well-drained Huntington soils and the slightly wet Lindside soils are on bottom lands and in depressions. The well drained Sequatchie, the moderately well drained Captina, and the moderately well drained or somewhat poorly drained Whitwell soils are on low terraces along the larger streams and in coves extending into the Cumberland Mountains.

About 90 percent of the association has been cleared and is used for cultivated crops, hay, and pasture. The rest is covered by hardwood trees that make up small woodlots on farms. Among the principal crops is corn, most of it grown on bottom land. Small grain, alfalfa, and nursery stock are some of the many crops grown on uplands. A large acreage is in nursery crops, for this is the largest area used for such crops in the State. A few farms have small patches of tobacco.

Farming on this association is diversified. Most common is general farming that includes the raising of beef cattle and hogs, but dairying and grain farming also are common. Farms generally range from 80 to 100 acres in size, and some are among the most productive in Warren County. As a rule, management is at a higher level than on other soil associations, and crop yields are fairly high. This association has a fairly large rural population, and most of the urban population in the county. The trend in farming is toward more livestock and a smaller acreage of crops.

This association is highly suitable for farming, and most of the soils are suited to all crops commonly grown, including alfalfa and others that are deep rooted. Nearly all the acreage is suited to row crops and to pasture. Normally, the soils can be plowed about 2 weeks earlier than the soils in the Dickson-Mountview association.

4. Hartsells-Ramsey association: Loamy soils on the Cumberland Plateau

This soil association rises from 700 to 1,000 feet above the Highland Rim and lies at an elevation of 1,800 to 1,950 feet on the Cumberland Plateau (fig. 6). Most of the area is gently rolling, but slopes adjacent to drainageways are short and steep. Because the drainageways are practically V-shaped, there is little bottom land. The entire association is underlain by sandstone bedrock, and all the soils developed in material weathered from it.

The Hartsells soils are dominant in this association, but the Ramsey and Linker soils also are important. The well-drained Hartsells and Linker soils occupy the gently rolling parts of the area, and together they account for about 75 percent of the total acreage. The Hartsells soils have a light-brown loamy surface layer and a yellowish clay loam subsoil. In the Linker soils the surface layer is brown and loamy, and the subsoil is red clay loam. The depth to bedrock in the Hartsells and Linker soils ranges from 2½ to 6 feet.

The Ramsey soils make up about 25 percent of the association and occur on hilly and steep, dissected slopes and at the ends of some of the narrow ridges. They are well-drained or excessively drained, droughty soils that have a light-brown, sandy surface layer and a yellowish, loamy subsoil. Sandstone bedrock is only 1 to 2 feet below the surface of the Ramsey soils, and it crops out in some places.

About 95 percent of this association is forested. Roughly 85 percent of the wooded acreage is covered by stands of mixed hardwoods or of shortleaf pine and hardwoods, and the rest has a cover of Virginia pine that reseeded naturally in abandoned fields. Cleared areas are used mainly for growing plants in nurseries, and a small acreage is pastured. Uncontrolled fire once burned over many acres of forest almost every year, but fire is infrequent now.

Except for the Ramsey soils, the soils in this association are well suited to farming, though little of their acreage is farmed. They are low in natural fertility and are strongly acid, but they are easily worked and, in most places, respond well to lime and fertilizer. The shallow Ramsey soils are not well suited to crops or pasture, but they are fairly productive of forest.

Potentially, this association is a good area for farming. At least three-fourths of it is suited to crops or pasture, and much of it has gentle slopes that can be cultivated in short cropping systems.

5. Rock land-Stony colluvial land association: Steep, rough, and rocky land on escarpments of the Cumberland Plateau

This extensive association is made up of steep and very steep, stony and rocky slopes that form the western escarpments of the Cumberland Plateau. It occurs at an elevation ranging from 1,100 feet at the edge of the Highland Rim to 1,900 feet on the plateau. In places the association rises 800 feet in less than a mile, for much of it is rough and mountainous. The bedrock consists of lime-

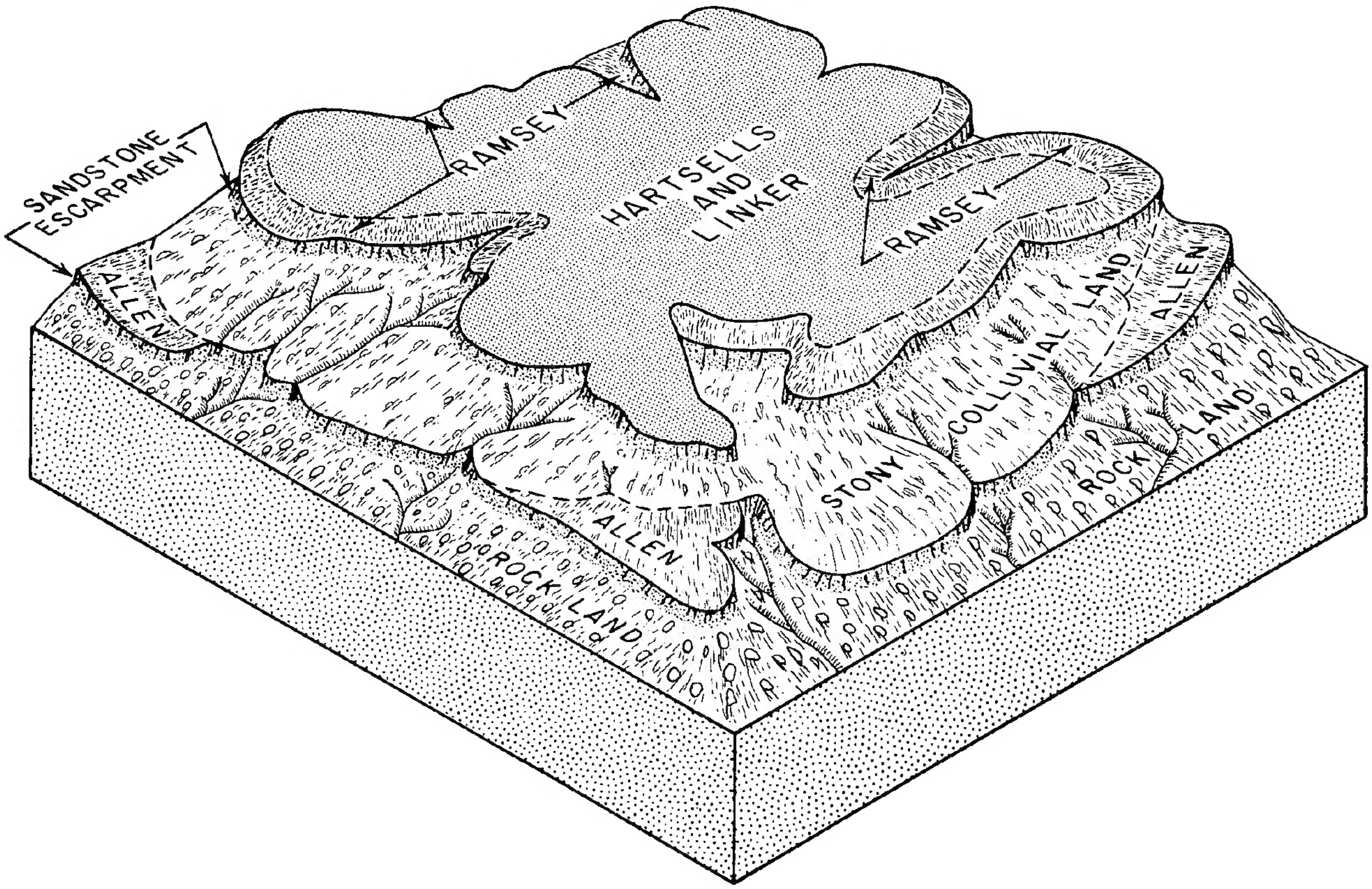

Figure 6.—**Major and minor soils in the Hartsells-Ramsey and the Rock land-Stony colluvial land associations.**

stone, sandstone, and shale that lie in level beds and are deeply dissected by winding streams. (See fig. 6.)

The upper part of the association consists of very steep to vertical cliffs of sandstone rock. Below the sandstone outcrops is steep and hilly Stony colluvial land that ranges from 1 to 10 feet in depth. The lower slopes are made up largely of steep limestone Rock land. In places the stony colluvium extends to the base of the escarpment and covers the limestone Rock land.

Stony colluvial land and Rock land occupy about equal acreages in the association.

Small areas of Allen, Jefferson, Swaim, Etowah, and other soils occupy narrow benches about halfway down the escarpment, at an elevation of 1,400 feet. In only a few places are these benches more than 200 feet wide. Also, the association includes outlying mountains with broad tops at an elevation of about 1,400 feet. Typical of these mountaintops is Little Cardwell Mountain, about 2 miles north of Shellsford.

Nearly all of the association is in forest of upland hardwoods. Some areas at the foot of the escarpment and in mountain coves are fairly suitable for permanent pasture, but most of them are nearly inaccessible. Only a few farms are wholly within the association. Farmers owning land in this part of the county generally have cropland in the adjacent valleys, though a few have cropland on adjacent ridgetops in the Hartsells-Ramsey association.

This association is of limited use for farming but is well suited to trees. On north-facing slopes of Stony colluvial land, the trees are of high quality and are growing fairly rapidly. On south-facing slopes of Stony colluvial land and on areas of Rock land, however, the trees generally are inferior and are growing more slowly. Common trees on Stony colluvial land are yellow-poplar, white oak, chestnut oak, red oak, beech, and hickory. Redcedar is common on Rock land and related shallow soils.

The association has many sites that are suitable for camping and picnicking. To supplement their income, landowners may wish to consider the construction of facilities for these forms of recreation. Many springs rise in the association and provide clear, cool water.

Descriptions of the Soils

This section describes the soil series (groups of soils) and single soils (mapping units) of Warren County. The acreage and proportionate extent of each mapping unit are given in table 1.

The procedure in this section is first to describe the soil series, and then the mapping units in that series. Thus, to get full information on any one mapping unit, it is necessary to read the description of that unit and also the description of the soil series to which it belongs. As

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent
	Acres	*Percent*
Allen clay loam, 12 to 20 percent slopes, severely eroded	223	(1)
Allen cobbly loam, 5 to 20 percent slopes	494	0. 2
Allen cobbly loam, 20 to 30 percent slopes	693	. 2
Allen loam, 2 to 5 percent slopes	227	(1)
Allen loam, 5 to 12 percent slopes	957	. 3
Allen loam, 12 to 20 percent slopes	737	. 3
Allen loam, 20 to 30 percent slopes	105	(1)
Baxter cherty silt loam, 5 to 12 percent slopes	5, 766	2. 0
Baxter cherty silt loam, 12 to 20 percent slopes	7, 147	2. 5
Baxter cherty silt loam, 20 to 30 percent slopes	4, 882	1. 7
Baxter cherty silt loam, 30 to 50 percent slopes	714	. 2
Baxter cherty silty clay loam, 5 to 12 percent slopes, severely eroded	867	. 3
Baxter cherty silty clay loam, 12 to 20 percent slopes, severely eroded	2, 285	. 8
Baxter cherty silty clay loam, 20 to 30 percent slopes, severely eroded	1, 062	. 4
Bodine cherty silt loam, 20 to 45 percent slopes	280	(1)
Bruno loamy sand	450	. 2
Captina silt loam, 1 to 3 percent slopes	5, 535	1. 9
Christian silt loam, 2 to 5 percent slopes, eroded	2, 464	. 9
Christian silt loam, 5 to 12 percent slopes	2, 054	. 7
Christian silt loam, 5 to 12 percent slopes, eroded	7, 335	2. 5
Christian silt loam, 12 to 20 percent slopes	367	. 1
Christian silt loam, 12 to 20 percent slopes, eroded	716	. 3
Christian silty clay loam, 5 to 12 percent slopes, severely eroded	2, 954	1. 0
Christian silty clay loam, 12 to 20 percent slopes, severely eroded	978	. 3
Cobbly alluvial land	461	. 2
Cumberland silt loam, 0 to 2 percent slopes	709	. 2
Cumberland silt loam, 2 to 5 percent slopes	4, 361	1. 5
Cumberland silt loam, 5 to 12 percent slopes, eroded	2, 799	1. 0
Cumberland silty clay loam, 5 to 12 percent slopes, severely eroded	1, 160	. 4
Cumberland silty clay loam, 12 to 20 percent slopes, severely eroded	628	. 2
Dickson silt loam, 1 to 4 percent slopes	21, 746	7. 6
Dunning silty clay loam	185	(1)
Elkins silt loam	252	(1)
Etowah cherty silt loam, 5 to 12 percent slopes	1, 622	. 6
Etowah cherty silt loam, 12 to 20 percent slopes	1, 536	. 5
Etowah cherty silt loam, 20 to 30 percent slopes	543	. 2
Etowah silt loam, 2 to 5 percent slopes	685	. 2
Etowah silt loam, 5 to 12 percent slopes	742	. 3
Etowah silt loam, 12 to 20 percent slopes	219	(1)
Gullied land	897	. 3
Guthrie silt loam	5, 482	1. 9
Hartsells loam, 2 to 5 percent slopes	2, 246	. 8
Hartsells loam, 5 to 12 percent slopes	5, 857	2. 0
Huntington cherty silt loam	1, 005	. 3
Huntington silt loam	14, 927	5. 2
Jefferson loam, 2 to 5 percent slopes	685	. 2
Jefferson loam, 5 to 12 percent slopes	911	. 3
Jefferson loam, 12 to 20 percent slopes	279	(1)
Jefferson loam, 12 to 20 percent slopes, severely eroded	481	. 2
Jefferson cobbly sandy loam, 5 to 20 percent slopes	431	. 2
Lawrence silt loam	4, 434	1. 5
Lindside silt loam	4, 857	1. 7
Linker loam, 2 to 5 percent slopes	156	(1)
Linker loam, 5 to 12 percent slopes	2, 381	. 8
Melvin silt loam	1, 318	. 5
Minvale silt loam, 2 to 5 percent slopes	341	. 1
Minvale silt loam, 5 to 12 percent slpoes	410	. 1
Mountview silt loam, 2 to 5 percent slopes	20, 916	7. 3
Mountview silt loam, 5 to 12 percent slopes	6, 680	2. 3
Mountview silt loam, 5 to 12 percent slopes, severely eroded	333	. 1
Ramsey loam, 5 to 12 percent slopes	461	. 2
Ramsey loam, 12 to 20 percent slopes	4, 441	1. 5
Ramsey loam, 20 to 30 percent slopes	434	. 2
Ramsey very rocky sandy loam, 10 to 20 percent slopes	568	. 2
Ramsey-Jefferson stony complex, 20 to 45 percent slopes	3, 780	1. 3
Rock land	20, 307	7. 1
Sango silt loam	2, 362	. 8
Sequatchie loam, 0 to 2 percent slopes	772	. 3
Sequatchie loam, 2 to 5 percent slopes	2, 356	. 8
Sequatchie loam, 5 to 12 percent slopes, eroded	766	. 3
Staser sandy loam, 0 to 2 percent slopes	1, 047	. 4
Staser sandy loam, 10 to 25 percent slopes	427	. 2
Stony colluvial land	18, 550	6. 4
Swaim silt loam, 3 to 10 percent slopes, eroded	595	. 2
Talbott silt loam, 5 to 12 percent slopes	330	. 1
Talbott very rocky complex, 5 to 20 percent slopes, eroded	1, 706	. 6
Talbott very rocky complex, 20 to 30 percent slopes, eroded	1, 621	. 6
Waynesboro loam, 0 to 2 percent slopes	429	. 2
Waynesboro loam, 2 to 5 percent slopes	17, 689	6. 1
Waynesboro loam, 5 to 12 percent slopes	2, 429	. 8
Waynesboro loam, 5 to 12 percent slopes, eroded	25, 608	8. 9
Waynesboro loam, 12 to 20 percent slopes, eroded	3, 341	1. 2
Waynesboro loam, 20 to 30 percent slopes	492	. 2
Waynesboro clay loam, 5 to 12 percent slopes, severely eroded	7, 809	2. 7
Waynesboro clay loam, 12 to 20 percent slopes, severely eroded	5, 161	1. 8
Waynesboro clay loam, 20 to 30 percent slopes, severely eroded	353	. 1
Waynesboro gravelly clay loam, 12 to 30 percent slopes, severely eroded	193	(1)
Waynesboro gravelly sandy loam, 5 to 12 percent slopes, eroded	280	(1)
Whitwell loam	1, 552	. 5
Total	[2] 287, 880	100. 0

[1] Less than 0.1 percent.
[2] Included are 54 acres of limestone quarries. These are shown on the map by name or by mine symbol, depending on size.

was mentioned in the section "How This Soil Survey Was Made," not all mapping units are members of a soil series. Gullied land and Stony colluvial land are miscellaneous land types and do not belong to a soil series but, nevertheless, are listed in alphabetical order along with the soil series.

Following the name of each mapping unit, there is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit are the capability unit and the woodland suitability group in which the mapping unit has been placed. The page on which each of these is described can be found readily by referring to the "Guide to Mapping Units" at the back of the soil survey.

Many terms used in the soil descriptions and other sections of the report are defined in the Glossary.

798-938—66——2

Allen Series

In the Allen series are deep, well-drained soils that occur largely on foot slopes and benches of the Cumberland Mountains. These soils formed in old local alluvium that washed or rolled down the mountain slopes. Slopes range from 2 to 30 percent.

The main layers of a typical profile are—

0 to 10 inches, brown, friable loam.
10 to 32 inches, yellowish-red, friable clay loam.
32 to 48 inches, red, friable clay loam or clay.

The alluvium extends to a depth of 2 to 15 feet and is underlain by 2 to 5 feet of yellowish-red clay that is underlain, in turn, by limestone bedrock. In many places small fragments and cobbles of sandstone, 3 to 10 inches across, are on the surface and throughout the profile.

Allen loam, 2 to 5 percent slopes (AnB).—This deep, well-drained loamy soil is mostly on benches and foot slopes along the base of the Cumberland Plateau escarpment. It occupies irregularly shaped areas of small or medium size. A few areas are on benches far up the slope. The surface layer is brown, friable loam 6 to 9 inches thick, and the subsoil is red, friable clay loam. In most places the soil is underlain by limestone bedrock at a depth of 5 to 25 feet, but on the higher slopes it is underlain by sandstone at a depth of 3 to 4 feet.

This soil is strongly acid and is low in natural fertility. Because it is moderately high in available water capacity and has a deep, friable, well-aerated root zone, the soil responds well to fertilization. If it is well fertilized and is otherwise well managed, it produces good yields of all crops grown locally. (Capability unit IIe–2; woodland suitability group 3)

Allen loam, 5 to 12 percent slopes (AnC).—Most areas of this soil are on benches and foot slopes along the base of the Cumberland Plateau escarpment, but a few areas are on benches far up the mountain slope. The soil is deep, loamy, and well drained. It has a brown loam surface layer 5 to 8 inches thick and a red, friable, loamy subsoil. Most areas are underlain by limestone bedrock at a depth of 5 to 25 feet, but the few areas at high elevations are underlain by sandstone at a depth of 3 to 4 feet. Generally, a few small fragments of sandstone are on the surface and throughout the profile.

This soil is very low in natural fertility and is strongly acid. It responds well to additions of fertilizer and lime, for it is moderately high in available water capacity and has a deep, friable root zone. Yields of all crops grown locally are good if the soil is well fertilized and otherwise is well managed. (Capability unit IIIe–2; woodland suitability group 3)

Allen loam, 12 to 20 percent slopes (AnD).—This deep, well-drained, loamy soil is mostly on the foothills of the Cumberland Plateau escarpment. Only a few areas are larger than 10 acres in size. The surface layer is brown, friable loam 5 to 8 inches thick, and the subsoil is red friable clay loam that normally has a few small sandstone fragments. Where the soil is eroded, the surface layer is a yellowish-brown loam. Bedrock occurs at a depth of 5 to 25 feet and, nearly everywhere, is limestone.

This soil is strongly acid and very low in natural fertility. Because it has a deep, permeable root zone and moderately high available water capacity, it responds well to fertilization, liming, and other good management. Slopes are too steep for frequent row cropping, but yields of pasture are good if the soil is fertilized and otherwise well managed. (Capability unit IVe–1; woodland suitability group 3)

Allen loam, 20 to 30 percent slopes (AnE).—This deep, loamy soil occupies lower mountain slopes and hillsides near the head of mountain coves. It formed in sediments that washed or drifted from the escarpment of the Cumberland Plateau. The surface layer of brown, friable loam ranges from 5 to 7 inches in thickness. The subsoil is red, friable clay loam. In most areas a few small sandstone fragments are on the surface and throughout the profile. The depth to limestone bedrock is 5 to 20 feet.

This soil is too steep for row crops. It is well suited to pasture and trees. Pasture yields are fairly high if the soil is well limed and fertilized and is otherwise well managed. (Capability unit VIe–1; woodland suitability group 3)

Allen clay loam, 12 to 20 percent slopes, severely eroded (AaD3).—This is a deep, well-drained, loamy soil on hillsides at the head of mountain coves and along the base of the Cumberland Plateau escarpment. Because erosion has been severe, the present plow layer consists of yellowish-red clay loam that formerly was part of the subsoil. Shallow gullies have formed in some places. The subsoil is red or yellowish-red clay loam that normally contains a few small fragments of sandstone. The depth to limestone bedrock is 5 to 25 feet.

In this soil natural fertility is low, tilth generally is poor, and the available water capacity is moderately low. Yields of row crops ordinarily are not good, but those of small grain and pasture are fair to good if the soil is well fertilized and limed and otherwise is well managed. (Capability unit VIe–1; woodland suitability group 3)

Allen cobbly loam, 5 to 20 percent slopes (AcD).—This deep, friable soil is on foot slopes and benches of the Cumberland Plateau escarpment. It has a brown cobbly loam surface layer that is 6 to 10 inches thick and is underlain by a yellowish-red or red, friable cobbly clay loam subsoil. The depth to limestone bedrock is 5 to 25 feet. Partly rounded cobbles, 3 to 10 inches across, are on the surface and throughout the soil. Normally, more than 15 percent of the soil mass is cobbles. Included is a small acreage that is eroded and has a yellowish-red cobbly clay loam surface layer.

This soil is strongly acid and low in natural fertility, but it responds moderately well to additions of fertilizer and lime. Permeability is moderately rapid in the surface layer and moderate in the subsoil. The available water capacity is moderately low. Cobbles and fragments of sandstone in the plow layer interfere with cultivation.

Most of this soil is in cutover forest of hardwoods, but some is used for pasture, and a small acreage is in crops. The soil is well suited to trees but is only fair to good for pasture. It is too sloping and too cobbly and droughty for good yields of row crops. (Capability unit VIs–1; woodland suitability group 3)

Allen cobbly loam, 20 to 30 percent slopes (AcE).—This soil is on steep slopes near the base of the Cumberland Plateau escarpment. It has a surface layer of friable cobbly loam, 6 to 9 inches thick, and a subsoil of yellowish-red or red, friable cobbly sandy clay loam or cobbly clay loam. Most areas are underlain by limestone bedrock at a depth of 5 to 20 feet, but a few are underlain by sandstone. Included is a small acreage that is severely eroded.

This soil is strongly acid and low in natural fertility. It has rapid surface runoff and dries out soon after a rain, especially on slopes facing south and west. Numerous cobbles reduce the available water capacity, which is moderately low, and make difficult the use of mowers and other machines.

This soil is mostly in hardwood forest that has been cut over, but some of it has been cleared and has grown up in pine. The soil is poorly suited to cultivated crops. It produces medium to low yields of pasture but is so steep and so cobbly that preparing the seedbed, planting the seed, and maintaining pasture are difficult. The soil is productive of trees. (Capability unit VIs–1; woodland suitability group 3)

Baxter Series

In the Baxter series are deep, cherty, well-drained soils that were derived from cherty limestone and are on rolling to steep uplands. In this county they are on ridgetops and hillsides of the Highland Rim. Slopes range from 5 to 50 percent, but they are less than 30 percent in most areas.

The main layers of a typical profile are—

0 to 8 inches, brown or yellowish-brown, friable cherty silt loam.

8 to 24 inches, yellowish-red, firm cherty clay or cherty silty clay loam.

24 to 48 inches, red, firm cherty clay streaked with yellowish brown.

Angular fragments of chert, as much as 5 inches across, are on the surface and throughout the profile. The depth to limestone bedrock ranges from 5 to 30 feet.

Baxter cherty silt loam, 5 to 12 percent slopes (BaC).—This soil is mainly in areas of 2 to 10 acres on hilltops. In most places it has a surface layer of yellowish-brown or brown, friable cherty silt loam, 6 to 9 inches thick, but in a few spots the original surface layer has been removed and the clayey subsoil exposed by erosion. The subsoil is yellowish-red cherty clay or cherty silty clay loam. Fragments of chert, 2 to 5 inches across, make up 15 to 25 percent of the soil, by volume. Bedrock is 5 to 30 feet below the surface and normally consists of cherty limestone. In some places, however, bedrock is partly siltstone, and in these places the chert is confined largely to the upper 10 inches of soil. Figure 7 shows a profile of this soil.

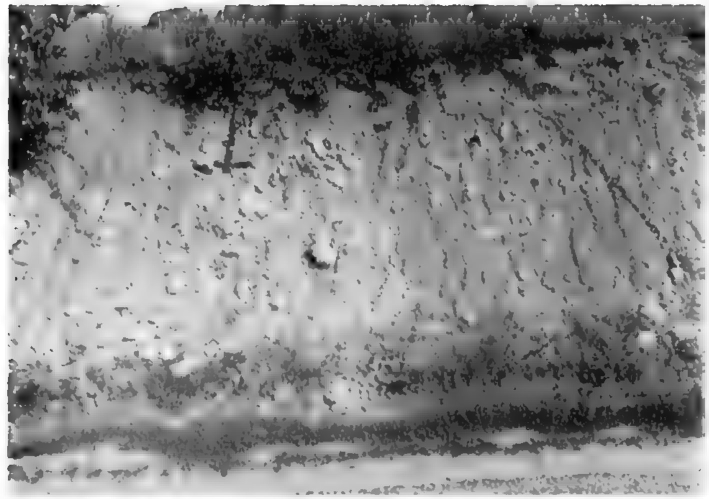

Figure 7.—**Profile of Baxter cherty silt loam, 5 to 12 percent slopes.**

This soil is strongly acid, low in natural fertility, and moderate in available water capacity. Although the chert interferes with cultivation and lowers productivity, the soil is suited to most crops commonly grown, and it responds well or fairly well to fertilizer. It is especially suited to small grain and to grasses and legumes for hay or pasture. Yields of these crops are medium if large amounts of fertilizer are used, but yields of corn, tobacco, and other summer annuals are low to medium. (Capability unit IIIe–4; woodland suitability group 5)

Baxter cherty silt loam, 12 to 20 percent slopes (BaD).—This deep, well-drained soil is on short hillsides. Its surface layer of cherty silt loam is brown, friable, and 5 to 8 inches thick. Its subsoil is yellowish-red or red cherty clay or cherty silty clay loam. In a few places most of the chert is in the upper 10 inches of the soil profile. In some places the underlying rock consists partly of siltstone. A few small spots are eroded, and these have a surface layer that is reddish and ranges to cherty silty clay loam because it contains material from the subsoil.

This soil is strongly acid and is low in natural fertility. The available water capacity is low or moderate. The response to management, including fertilization, is only fair.

Woodland occupies nearly half of this soil. Tilled crops are poorly suited, but small grain, hay, and pasture produce medium yields if large amounts of fertilizer are applied. (Capability unit IVe–2; woodland suitability group 5)

Baxter cherty silt loam, 20 to 30 percent slopes (BaE).—This soil is on steep hillsides of the Highland Rim, much of it in small woodlots on farms. It has a brown or yellowish-brown, friable cherty silt loam surface layer that is 5 to 9 inches thick and that overlies a yellowish-red cherty silty clay loam or cherty clay subsoil. Limestone bedrock occurs at a depth of 5 to 25 feet. The content of chert ranges from 20 to 30 percent by volume. Included are a few severely eroded patches and spots that have a surface layer of cherty silty clay loam.

This soil is permeable to water and roots, but it has moderate available water capacity and dries out soon after rain, especially on warm slopes facing south or west. Although surface runoff is rapid, the amount of runoff is less than on Christian soils with similar slopes, for chert fragments on the surface help to increase water intake by absorbing some of the impact of rain that otherwise would puddle the finer textured soil material.

This soil is poorly suited to cultivated crops. If it is well fertilized, however, it produces fair pasture and is well suited to tall fescue, orchardgrass, white clover, and common lespedeza. Tall fescue may be longer lived than orchardgrass because of low natural fertility and possible drought in summer. (Capability unit VIe–2; woodland suitability group 5)

Baxter cherty silt loam, 30 to 50 percent slopes (BaF).—This soil is mainly on short slopes, many of them adjacent to rivers and creeks. In most places the surface layer is brown, friable cherty silt loam, about 8 inches thick. The upper part of the subsoil is 6 to 8 inches of strong-brown or yellowish-red cherty silty clay loam, and the lower part is yellowish-red or red cherty silty clay loam

or cherty clay. The depth to bedrock is 5 to 20 feet. The content of chert ranges from 15 to 30 percent, by volume. In a few areas most of the chert is in the upper 1 foot of soil, and only a small amount occurs below that depth. In these few areas, bedrock is mainly limestone but partly siltstone.

Most areas of this soil are woodland, but a few have been cleared. The cleared areas have a few eroded spots where the present surface layer is 6 inches thick and consists mostly of material from the yellowish-red, clayey subsoil. This very steep, cherty soil is fairly productive of trees but is poorly suited to pasture. (Capability unit VIIe–1; woodland suitability group 5)

Baxter cherty silty clay loam, 5 to 12 percent slopes, severely eroded (BcC3).—This well-drained, cherty soil is mainly in small areas on hilltops. Most of the original surface layer has been lost through erosion, and the plow layer of yellowish-red or strong-brown cherty silty clay loam or cherty clay consists of material from the subsoil mixed with the small remaining part of the original surface layer. The subsoil is yellowish-red or red, sticky cherty clay or cherty silty clay loam. Limestone bedrock is at a depth of 5 to 30 feet. Chert fragments, 2 to 5 inches across, make up 15 to 25 percent of the soil, by volume. In some fields there are many rills and a few deep gullies. In some areas the underlying rock consists partly of siltstone. In these areas much of the chert is concentrated in the surface layer, and little of it is in the subsoil.

Generally, chert fragments in this soil interfere with cultivation and reduce productivity. The soil is low in natural fertility and is strongly acid. It is so clayey that it is difficult to keep in good tilth, and it can be cultivated within only a narrow range of moisture content. If the soil is cultivated when too wet or too dry, clods and crusts are formed. The available water capacity is low, and crops lack sufficient moisture in dry periods. In places where the surface layer or the subsoil is red clay, penetration of roots and moisture is slow.

Because this soil is strongly sloping and has a clayey surface layer, it is poorly suited to cultivated crops. If it is adequately fertilized and otherwise is well managed, it can be used for small grain and for red clover, white clover, orchardgrass, tall fescue, lespedeza, and other suitable grasses and legumes. (Capability unit IVe–2; woodland suitability group 5)

Baxter cherty silty clay loam, 12 to 20 percent slopes, severely eroded (BcD3).—This cherty, clayey soil is on hillsides. Its plow layer consists mostly of subsoil material and is yellowish-red or yellowish-brown cherty silty clay loam or cherty clay. Below this layer is yellowish-red cherty clay. The depth to limestone bedrock ranges from 5 to 25 feet. Shallow gullies are numerous in places, and a few deep ones have formed in some fields.

This soil has low available water capacity. Most of the acreage is idle or abandoned and is sparsely covered by volunteer plants. Part of it is in pasture, and a few areas still are used for tilled crops. Yields commonly are low.

The soil is poorly suited to cultivated crops but is fairly well suited to pasture. Good tilth is hard to maintain because the plow layer has a high content of clay. Clods are formed if the soil is worked when wet. Fair to good pasture can be established and maintained, though fertilizer is needed in large amounts. Tall fescue, white clover, orchardgrass, and lespedeza are suitable for pasture, but good stands are difficult to establish on this clayey soil. Tall fescue ordinarily outlasts orchardgrass because the soil dries rapidly. (Capability unit VIe–2; woodland suitability group 5)

Baxter cherty silty clay loam, 20 to 30 percent slopes, severely eroded (BcE3).—This cherty, clayey soil formed from cherty limestone on steep hillsides. Erosion has removed so much of the original surface layer that the plow layer consists mostly of subsoil material. The plow layer is yellowish-red or strong-brown cherty silty clay loam or cherty clay. In most places the depth to limestone bedrock is 5 to 25 feet. Some areas are cut by gullies that are too deep or too broad to be filled by ordinary tillage.

This soil is strongly acid, is low in natural fertility, and has low available water capacity. Water is absorbed slowly, and much of it is lost as surface runoff, which is difficult to control. Tilth is hard to maintain, for the plow layer gets cloddy if it is cultivated when wet.

Most areas of this soil have been abandoned and are covered by trees or unimproved pasture. The soil is poorly suited to tilled crops and is only fairly well suited to pasture. Tall fescue and white clover are among the best plants for pasture, but obtaining good yields is expensive and requires large amounts of lime, fertilizer, and manure. Although orchardgrass can be grown, it generally is short lived because the soil is droughty. (Capability unit VIe–2; woodland suitability group 5)

Bodine Series

The Bodine series consists of light-colored, very cherty, droughty soils that formed from cherty limestone. These soils are on steep hillsides of the deeply dissected Highland Rim, mostly in the extreme northern part of the county. Slopes range from 20 to 45 percent.

The main layers of a typical profile are—

0 to 8 inches, brown, friable cherty silt loam.
8 to 36 inches, yellowish-brown cherty silty clay loam or cherty silt loam.

Angular fragments of chert, as much as 8 inches across, are on the surface and throughout the profile. Chert fragments make up 30 to 60 percent of the soil mass. The depth to bedrock ranges from 2½ to 10 feet.

Bodine cherty silt loam, 20 to 45 percent slopes (BoE).—This light-colored, very cherty soil is on steep hillsides. The silt loam surface layer, 8 to 10 inches deep, is brown, friable, and cherty or very cherty. The subsoil is yellowish-brown, friable cherty silt loam or cherty silty clay loam that extends to a depth of about 30 inches. Underlying the subsoil is a mixture of chert and yellowish-brown silt loam. The depth to bedrock or chert beds ranges from 2½ to 10 feet.

This soil is very strongly acid and very low in natural fertility. It is rapidly permeable, has a well-aerated root zone, and is very droughty, especially on south- and west-facing slopes. The available moisture capacity is so low that heavy fertilization is not justified.

Nearly all of this soil is in cutover hardwood forest. Red oak, white oak, hickory, and beech make up most of the stands, but yellow-poplar thrives on slopes facing north and east.

This soil is best suited to trees. It is too steep, too cherty, and too droughty for producing favorable yields of crops or pasture. If pasture is grown, however, tall fescue and

clovers are best suited. Moderate amounts of fertilizer and lime are required for establishing and maintaining pasture plants. (Capability unit VIIs-2; woodland suitability group 5)

Bruno Series

In the Bruno series are very sandy soils on bottom lands. These soils formed in young alluvium in places where streams deposited sand over the flood plain.

The main layers of a typical profile are—

0 to 10 inches, pale-brown, very friable loamy sand.
10 to 36 inches, light yellowish-brown, loose loamy sand.

Bruno loamy sand (1 to 3 percent slopes) (Br).—This very sandy soil lies in narrow strips next to stream channels, mostly along Hickory Creek and Barren Fork. The soil generally is flooded for several hours every year or two. It has a surface layer of pale-brown, loose loamy sand, 8 to 10 inches thick, and a subsoil of light yellowish-brown, loose loamy sand or sand. A large part of this soil is just sand, so the surface is hummocky. Quartzite pebbles and other pieces of gravel are scattered throughout the profile.

This soil is medium acid and is low in natural fertility. It has very rapid internal drainage and is very low in available water capacity.

Much of the acreage has been cleared and is used for pasture. Some areas are idle, and others supply sand for commercial uses. Forested areas are in cutover stands of mixed hardwoods. Because the soil is droughty, it produces low yields of pasture and crops. Early maturing crops are best suited, but tall fescue and some of the clovers can be grown. The response to good management is poor because little moisture is available to plants. (Capability unit IIIs-1; woodland suitability group 10)

Captina Series

The soils of the Captina series are moderately well drained and have a fragipan. They formed in old alluvium that washed from soils derived from loess and from limestone, shale, and sandstone on uplands. Captina soils are mostly on low foot slopes and second bottoms that are only a few feet above the flood plain. They occupy slopes of 1 to 3 percent but are nearly level in most places.

The main layers of a typical profile are—

0 to 9 inches, dark-brown, friable silt loam.
9 to 24 inches, yellowish-brown friable silty clay loam or silt loam.
24 to 45 inches, yellowish-brown, compact silty clay loam that is mottled with shades of gray.
45 to 60 inches, mottled red, gray, and yellowish-brown, firm silty clay loam.

The depth to bedrock ranges from 5 to 30 feet.

Captina silt loam, 1 to 3 percent slopes (CaB).—This is a moderately well drained soil on terraces. It has a surface layer of dark-brown, friable silt loam, 8 to 10 inches thick, that is underlain by a layer of yellowish-brown, friable silty clay loam or silt loam extending to a depth of 22 to 28 inches. Below this layer and extending to a depth of about 45 inches is a fragipan of dense, mottled brown and gray silty clay loam or silt loam. In places where this soil adjoins Cumberland and Waynesboro soils, the original surface layer has been recently covered by a reddish-brown overwash 4 to 6 inches thick. In a few places the soil is free of mottling to a depth of 30 to 36 inches. A few areas included in mapping have a slope of more than 5 percent.

Figure 8.—**An area of Captina silt loam, 1 to 3 percent slopes, under a stand of orchardgrass. In the background is an area of severely eroded Cumberland soils.**

This soil is strongly acid, moderate to moderately low in natural fertility, and moderately high in available water capacity. It is permeable and friable to a depth of 18 to 28 inches, but roots and moisture penetrate very slowly below that depth. Much of the time in winter and spring, the fragipan and the soil above it are saturated by a perched water table. Nevertheless, the soil is easily kept in good tilth and responds well to management.

About 85 percent of this soil has been cleared and is planted to many kinds of crops (fig. 8). The rest is in small woodlots on farms. The soil is suited to most of the crops grown in the county and, if well fertilized, produces satisfactory yields. Alfalfa, however, ordinarily lasts only 2 or 3 years because the subsoil is excessively wet at times. Planting tobacco also is risky because the stand is likely to drown out when rainfall is heavy. (Capability unit IIe-3; woodland suitability group 7)

Christian Series

The Christian series consists of deep, well-drained soils that were derived from interbedded siltstone and limestone. These soils occupy slopes of 2 to 20 percent on ridgetops and hillsides of the Highland Rim. They have a thin, silty surface layer and a thick, tight, clayey subsoil.

The main layers of a typical profile are—

0 to 6 inches, brown, friable silt loam.
6 to 38 inches, yellowish-red, firm silty clay or clay.
38 to 60 inches, mottled red, yellow, and brown, firm silty clay.

A few chert fragments are in the surface layer, but there is little chert in the subsoil. The depth to bedrock ranges from 2½ to 10 feet.

Christian silt loam, 2 to 5 percent slopes, eroded (ChB2).—This deep, well-drained soil formed in material weathered from shaly limestone and siltstone on uplands. The surface layer of brown, friable silt loam generally is 6 to 8 inches thick, but it is 8 or 9 inches thick in wooded

areas, which account for 10 to 15 percent of the total acreage. The subsoil, to a depth of 28 to 32 inches, is yellowish-red, plastic silty clay or clay. This is underlain by tight clay or silty clay that is variegated with red, yellow, and brown. Bedrock occurs at a depth ranging from 4 to 10 feet.

A few small fragments of chert are on the surface, and chert fragments make up 3 to 5 percent of the soil, by volume. Because the original surface layer has been thinned by erosion, cultivation mixes a small amount of subsoil material into the plow layer, and some fields have a few spots where the clayey subsoil is exposed. Included in areas mapped are a few areas that have a loam surface layer and a clay loam subsoil.

This soil is strongly acid and low in natural fertility. It can be kept in good tilth but should be cultivated within only a narrow range of moisture content. The soil is well aerated in the top 10 to 15 inches, but root growth is slow in the lower part. Because the available water capacity is low, the response to added fertilizer is not high.

This soil is suited to general crops and to legumes and grasses. Yields of row crops ordinarily are low, however, because the soil is slightly droughty and has a clayey subsoil. Yields of legumes, grasses, and small grains are favorable if the soil is limed, fertilized, and otherwise well managed. (Capability unit IIIe-4, woodland suitability group 6)

Christian silt loam, 5 to 12 percent slopes (ChC).—This soil is in small tracts on hills. It developed in material derived from siltstone and limestone. The surface layer is brown, friable silt loam 7 to 9 inches thick. The subsoil of very firm silty clay or clay is normally yellowish red but is yellowish brown in a few places. In most areas there are a few small fragments of chert. The depth to partly weathered, shaly rock is 3 to 10 feet.

This soil is strongly acid and low in natural fertility. It is moderately low in available water capacity and responds moderately well to fertilization and liming. The small amount of chert does not interfere with tillage.

This soil is wooded in some areas and has been recently cleared in others. Because it is sloping and has a clayey subsoil, it generally produces only medium yields of row crops. If the soil is limed and fertilized, it produces satisfactory yields of small grain, grasses, and most legumes. Alfalfa does not grow well and is not long lived. (Capability unit IVe-2; woodland suitability group 6)

Christian silt loam, 5 to 12 percent slopes, eroded (ChC2).—This is a clayey soil of the uplands. It has a surface layer of brown, friable silt loam, 4 to 7 inches thick, and a subsoil of yellowish-red, plastic silty clay or clay through which water moves slowly. A few patches are severely eroded. The depth to siltstone and limestone bedrock is 3 to 10 feet.

This soil is low in natural fertility and is strongly acid. Because of its moderate slopes and clayey subsoil, infiltration is retarded and surface runoff develops quickly during rains. The available water capacity is moderately low, and the response to management is only fair.

This soil is well suited to small grain and to grasses and legumes for pasture and hay and, if well fertilized and otherwise well managed, produces favorable yields of these crops. Because the soil is somewhat droughty, it produces only moderate yields of row crops and crops that mature late. (Capability unit IVe-2; woodland suitability group 6)

Christian silt loam, 12 to 20 percent slopes (ChD).—This moderately steep soil occurs on hillsides and formed in material derived from siltstone and sandstone. It has a surface layer of brown, friable silt loam that is 6 to 10 inches thick, and this is underlain by a subsoil of yellowish-red or red, plastic silty clay or clay. The soil contains a few fragments of chert. The depth to siltstone and limestone bedrock is 3 to 10 feet.

This soil is strongly acid, is low in natural fertility, and has moderately low available water capacity. Although it is forested in most areas, it is suited to grasses and legumes used for hay or pasture. These crops and small grain can be grown if the soil is well managed and is fertilized in amounts indicated by soil tests. Because the soil is somewhat droughty and has a fairly shallow root zone, it would produce only medium yields of cultivated crops. (Capability unit VIe-2; woodland suitability group 6)

Christian silt loam, 12 to 20 percent slopes, eroded (ChD2).—This well-drained, clayey soil formed from siltstone and limestone on hillsides of the Highland Rim. Most areas are 2 to 5 acres in size. The plow layer is brown, friable silt loam, and the subsoil is yellowish-red, plastic silty clay or clay. Bedrock lies at a depth of 3 to 10 feet. In many places cultivation has brought some of the subsoil into the plow layer, and in small severely eroded spots erosion has exposed the reddish subsoil.

Because surface runoff is rapid and water moves slowly through the subsoil, this soil erodes easily. It is strongly acid and low in natural fertility. The available water capacity is moderately low, and crops make only fair response to good management and fertilization.

This soil is poorly suited to corn, tobacco, and other row crops. If it is adequately limed and fertilized, however, it produces satisfactory yields of small grain, hay, and pasture. Among the plants suitable for pasture are tall fescue, orchardgrass, white clover, and lespedeza. Figure 9 shows an area of this soil that was cropped and then abandoned. (Capability unit VIe-2; woodland suitability group 6)

Figure 9.—**An area of Christian silt loam, 12 to 20 percent slopes, eroded, that was cropped in the past but now is covered with native grass and other plants.**

Christian silty clay loam, 5 to 12 percent slopes, severely eroded (CnC3).—This clayey soil on uplands has had most of its original surface layer removed through erosion. The plow layer is strong-brown or yellowish-red silty clay loam and consists of the small remaining part of the original surface layer mixed with material from the subsoil. The subsoil is yellowish-red, plastic silty clay or clay. The depth to limestone and siltstone bedrock is 3 to 10 feet. Some chert fragments occur, but they are not so numerous as to interfere with tillage. Rills and a few deep gullies are common in some fields.

This soil is strongly acid and low in natural fertility. Roots and water penetrate very slowly, and tilth is difficult to maintain because of the high content of clay and the very low content of organic matter. The available water capacity is low.

In most years this soil cannot produce favorable yields of row crops, because root growth is shallow and moisture is scarce. In addition, the clayey plow layer makes a poor seedbed and does not favor good stands. Fair yields are obtained from small grain and from grasses and legumes, especially tall fescue and white clover. (Capability unit VIe–2; woodland suitability group 6)

Christian silty clay loam, 12 to 20 percent slopes, severely eroded (CnD3).—This severely eroded soil has lost most of its original surface layer and, in most places, part of its subsoil. The plow layer is yellowish-red, sticky silty clay loam or clay. The subsoil is mottled red, yellowish-red, and yellow, sticky clay or silty clay. Bedrock of siltstone and limestone is at a depth of 2½ to 10 feet. Gullies are common in many fields.

This soil generally is in very poor tilth, has a very low content of organic matter, and is low in plant nutrients. Runoff is rapid, and the available water capacity is very low.

Nevertheless, if the soil is adequately limed, frequently fertilized, and otherwise well managed, fair to good stands of selected pasture plants can be established and maintained. Tall fescue, white clover, and lespedeza can be grown successfully, but the soil generally is too droughty for orchardgrass. By growing close-growing pasture plants and grazing them for a number of years, tilth can be improved, the content of organic matter maintained, and the available water capacity increased. Then, higher yields can be obtained. (Capability unit VIe–2; woodland suitability group 6)

Cobbly Alluvial Land

Cobbly alluvial land (Co) occupies deep, excessively drained bottom land along streams in mountain coves, mainly Hills Creek and its tributaries in the southeastern part of the county. It is nearly level or gently sloping and is flooded once in 3 to 10 years. The soil material is brown, very friable sandy loam or loam, and in places there is a thin underlying layer of strong-brown very cobbly loam or very cobbly sandy clay loam. The depth to limestone bedrock ranges from 4 to 15 feet. From 30 to 60 percent of the land is covered with many rounded pebbles and larger pieces of sandstone that generally range from 4 to 10 inches across but are as large as 18 inches in places.

Cobbly alluvial land is medium acid, moderately low in natural fertility, and low in available water capacity. Most areas are too cobbly or stony to cultivate. About 40 percent of the acreage is wooded, and the rest is idle or in unimproved pasture. The land probably is best suited to trees, but some of the less stony areas are suited to pasture or nursery stock. (Capability unit VIIs–1; woodland suitability group 12)

Cumberland Series

The Cumberland series is made up of deep, well-drained soils on high stream terraces. These soils formed in alluvium. Slopes range from 0 to 20 percent but are 2 to 5 percent in most areas.

The main layers of a typical profile are—

0 to 10 inches, dark reddish-brown or dark-brown, friable silt loam.
10 to 50 inches, dark-red, firm clay loam or clay.

In places there are rounded pebbles of chert and quartzite on the surface and in the soil. The alluvial deposits range from 3 to 20 feet in thickness and, in most places, are underlain by red, cherty clay or clay that formed in material weathered from limestone. Several areas have numerous sinkholes and depressions.

The Cumberland soils are fairly extensive in a belt of high terraces that extends westward several miles from the foot of the Cumberland Plateau escarpment. These terraces lie 50 to 200 feet above the flood plain and are 1,000 to 1,100 feet above sea level.

Cumberland silt loam, 0 to 2 percent slopes (CsA).—This nearly level, deep, productive soil is on high stream terraces, next to the more sloping Cumberland soils. It formed in alluvial deposits that average about 15 feet in thickness. The surface layer is dark-brown or dark reddish-brown silt loam 8 to 10 inches thick. The upper part of the subsoil is 6 to 10 inches of clay loam or silty clay loam that generally is dark reddish brown but is reddish brown or yellowish red in a few places, particularly in level or depressional areas. Below this layer is a lower subsoil consisting of dark-red clay or clay loam, several feet thick. Included are some areas that have a loam surface layer.

This soil is one of the most productive in the county. It has a very deep root zone, is high in available water capacity, and can be used for row crops every year. All crops suited to the climate produce favorable yields, and alfalfa and other deep-rooted legumes are especially productive. The response to fertilization and other good management is excellent. (Capability unit I–1; woodland suitability group 3)

Cumberland silt loam, 2 to 5 percent slopes (CsB).—This is a deep, well-drained soil on high terraces of the Highland Rim. It formed in old alluvium that washed from soils derived chiefly from limestone. The average thickness of the alluvium is about 15 feet. This soil has a plow layer of dark reddish-brown or dark-brown, friable silt loam, 5 to 9 inches thick, and a subsoil of dark-red, firm clay loam or clay. In small eroded spots the plow layer is dark-red clay loam.

This soil is one of the most productive in the county. It has a deep root zone, is high in available water capacity, and responds well to management. The soil is medium acid to strongly acid and is moderate in natural fertility.

Well suited to this soil are all crops commonly grown, especially alfalfa. Satisfactory yields can be obtained if large amounts of lime and fertilizer are added. Plants

excellent for pasture are orchardgrass, red clover, white clover, Ladino clover, and bluegrass. (Capability unit IIe-1; woodland suitability group 3)

Cumberland silt loam, 5 to 12 percent slopes, eroded (CsC2).—This deep, well-drained, fertile soil formed in old alluvium that washed from soils derived mostly from limestone. The plow layer is dark reddish-brown, friable silt loam 4 to 7 inches thick, and the subsoil is dark-red, firm clay or clay loam 3 to 10 feet thick. The thickness of the alluvium ranges from 4 to 15 feet. Bedrock is commonly more than 10 feet below the surface. In some of the more sloping fields, a few eroded spots have a plow layer of red clay.

This soil is medium acid or strongly acid and moderate in natural fertility. Because its root zone is deep and well aerated and the available water capacity is high, the soil is productive and responds well to management.

This soil is suited to many kinds of crops. It is especially productive of grasses and legumes, including alfalfa and red clover, and it also produces adequate yields of cultivated crops, though slopes are too strong for frequent cultivation. (Capability unit IIIe-1; woodland suitability group 3)

Cumberland silty clay loam, 5 to 12 percent slopes, severely eroded (CuC3).—This soil is in small tracts on short slopes. It has a plow layer of dark-red, friable or firm clay loam or silty clay loam that consists mostly or entirely of material brought up from the dark-red, firm clay or clay loam subsoil. Small, shallow gullies have formed in some areas, but almost all of them can be filled during tillage. The depth to limestone bedrock is commonly more than 10 feet.

This soil is medium acid or strongly acid and is moderate in natural fertility. The clayey plow layer is in poor tilth, and it is only slowly penetrated by moisture. Rapid runoff causes a severe hazard of further erosion, but the soil has a deep root zone and responds well to management.

Ordinarily, cultivated crops produce only medium yields on this soil because the stands are poor. Once established, however, the plants grow well. Satisfactory yields can be obtained from small grain and from grasses and legumes for hay or pasture. Alfalfa and other deep-rooted legumes are especially productive. (Capability unit IVe-1; woodland suitability group 3)

Cumberland silty clay loam, 12 to 20 percent slopes, severely eroded (CuD3).—This soil occurs mainly on strong, short slopes that encircle sinkholes. It has lost almost all of its original dark-brown surface layer and, in places, part of its dark-red clay subsoil through erosion. The plow layer is dark-red silty clay loam, clay loam, or clay that is plastic when wet and hard when dry. Some areas have shallow gullies that generally can be crossed with farm machinery and can be filled by normal tillage.

This soil is strongly acid and contains little organic matter. It is lower in natural fertility and in available water capacity than less eroded Cumberland soils. It is moderately permeable to roots, but it takes in moisture so slowly that surface runoff is rapid and the hazard of further erosion is severe. Because the soil has a high content of clay, it is generally in poor tilth and is difficult to work.

This soil is better suited to close-growing crops or to permanent pasture than it is to tilled crops. Corn and other cultivated crops can be grown in a long cropping sequence, but yields commonly are low. If the soil is adequately fertilized and is otherwise well managed, it produces favorable yields of orchardgrass, alfalfa, white clover, Ladino clover, tall fescue, and other plants for hay and pasture. (Capability unit VIe-1; woodland suitability group 3)

Dickson Series

In the Dickson series are light-colored, silty soils that have a fragipan at a depth of about 2 feet. These soils occupy slopes of 1 to 4 percent in areas of undulating relief on the Highland Rim. They formed in 2 to 3 feet of loess underlain by red clay or cherty clay. The fragipan is penetrated by few if any roots.

The main layers of a typical profile are—

- 0 to 7 inches, grayish-brown or brown, friable silt loam.
- 7 to 26 inches, yellowish-brown, friable silt loam or silty clay loam.
- 26 to 40 inches, mottled yellow, brown, and gray silt loam that is compact and brittle.
- 40 to 60 inches, mottled yellowish-red and brown cherty clay or clay.

Dickson silt loam, 1 to 4 percent slopes (DkB).—This moderately well drained, silty soil formed in a layer of loess, about 3 feet thick, underlain by yellowish-red or red clay that is cherty in many places. The plow layer is brown, friable silt loam 6 to 9 inches thick, and the subsoil is yellowish-brown, friable silt loam. A fragipan occurs at a depth of about 2 feet and is underlain by red clay or cherty clay derived from limestone. The fragipan varies somewhat in degree of development; it is generally strong but is weak in a few places. It ranges from 18 to 30 inches in depth and from 4 to 20 inches in thickness.

This soil is strongly acid and low in natural fertility. Internal drainage is medium or slow. The available water capacity is high above the fragipan and is low within and below it. Above the fragipan the soil is waterlogged in winter and early in spring, but it dries out in summer and fall.

This soil is mainly in the western part of the county, and about 90 percent of the acreage has been cleared. Almost all the common crops are suited, and yields are favorable if large amounts of fertilizer are added. The soil responds well to good management.

Alfalfa is perhaps the least suited crop because the stand thins or dies out after 2 or 3 years, particularly where fields are level and slow to drain. Yields of tobacco are satisfactory in most years, but plants in low spots may drown during periods of heavy rainfall. Gently sloping areas are better suited to tobacco and alfalfa than level areas. (Capability unit IIe-3; woodland suitability group 7)

Dunning Series

The Dunning series is made up of wet, dark-colored, very poorly drained soils on level bottom lands. These soils formed in alluvium that washed from clayey soils of the uplands.

The main layers of a typical profile are—

- 0 to 18 inches, black silty clay loam with a few brown mottles.
- 18 to 28 inches, dark-gray, plastic silty clay or clay with a few olive mottles.

Figure 10.—**A cultivated field of Dunning silty clay loam on nearly level bottom land. At the left is an area of Whitwell loam.**

28 to 38 inches, gray, plastic silty clay or clay with many olive mottles.

Dunning silty clay loam (0 to 2 percent slopes) (Du).—This soil is nearly level, black, and very poorly drained. It occurs in low areas, mostly along large streams in the county (fig. 10). The surface layer consists of black silty clay loam that is about 18 inches thick and, in some places, is covered by a brown overwash 2 to 5 inches thick. In some places the surface layer is nearly silt loam in the upper 8 inches.

This soil is subject to flooding for a few weeks in winter and spring. Most areas are covered by floodwater every 2 or 3 years, but a few are flooded every year. Air and roots penetrate the soil only with difficulty, and water moves over the surface and through the clayey subsoil very slowly. The soil has a water table near the surface during winter and spring, but it dries out, shrinks, and cracks in summer and fall. It can be cultivated within only a narrow range of moisture content, for if it is worked when too wet or too dry, tough lumps and clods are formed. The soil is slightly acid or neutral and is moderately high in natural fertility. It responds fairly well to fertilization and does not need to be limed.

About half the acreage of this soil is in stands of willow oak, blackgum, sweetgum, and red maple. Tall fescue, bermudagrass, white clover, and soybeans are suited crops. (Capability unit IIIw-1; woodland suitability group 8)

Elkins Series

The Elkins series consists of poorly drained, black, silty soils in nearly level depressions on uplands of the Highland Rim. These soils formed in alluvium recently washed from the Mountview soils and other silty soils.

The main layers of a typical profile are—

0 to 12 inches, black, friable silt loam.
12 to 36 inches, dark-gray, friable silt loam that has a few olive-colored mottles.

Elkins silt loam (0 to 2 percent slopes) (Ek).—This poorly drained soil is in nearly level depressions on the Highland Rim. It has a black, friable silt loam surface layer, about 12 inches thick, that is underlain by friable silt loam that is dark gray mottled with olive. The depth to limestone and siltstone bedrock is 15 feet or more.

This soil is covered by standing water in wet periods, but it dries out in time for summer-maturing annual crops to be planted late in spring or early in summer. Although the soil is strongly acid and is low in natural fertility, it responds well to lime and fertilizer.

About 60 percent of this soil is in stands of willow oak, blackgum, sweetgum, red maple, and other water-tolerant trees. The remaining acreage is used for tall-fescue pasture or for corn, soybeans, hay, and other crops.

The use of the soil is limited by poor drainage. Undrained areas are suited to tall fescue, white clover, annual lespedeza, soybeans (fig. 11), and trees. If a suitable outlet is available, the soil can be drained by tilling or ditching. Areas that are drained and well fertilized produce favorable yields of many kinds of crops. (Capability unit IIIw-1; woodland suitability group 11)

Etowah Series

The Etowah series consists of deep, productive, well-drained soils that formed in alluvium. These soils lie on terraces 15 to 100 feet above the present flood plain and on foot slopes of the Cumberland Mountains. Slopes range from 2 to 30 percent but are between 2 and 20 percent in most places.

The main layers of a typical profile are—

0 to 8 inches, dark-brown, friable silt loam.
8 to 42 inches, yellowish-red or reddish-brown, friable silty clay loam.
42 to 55 inches, yellowish-red firm silty clay loam with streaks of yellow.

The alluvium ranges from 5 to 15 feet in thickness and is underlain by several feet of red or yellowish-red cherty clay or clay derived from limestone. Many areas have angular fragments of chert, as much as 10 inches across, on the surface and throughout the profile.

Etowah silt loam, 2 to 5 percent slopes (EwB).—This deep, well-drained soil—one of the most productive soils in the county—has a plow layer of dark-brown, friable silt loam. The subsoil generally is friable silty clay loam that is dominantly yellowish red but, in some areas, is reddish

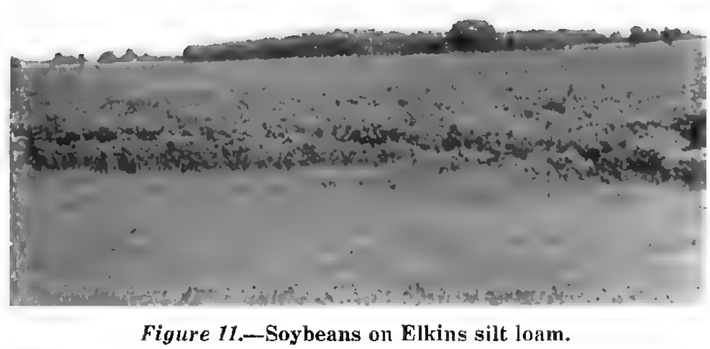

Figure 11.—**Soybeans on Elkins silt loam.**

brown or red. In places the subsoil is clay loam. The alluvium in which the soil developed ranges from 5 to 15 feet in thickness and is underlain by red or yellowish-red cherty clay or clay derived from limestone bedrock. Included with this soil in mapping are areas that have a plow layer of loam.

This soil is moderate in natural fertility and has high available water capacity. It is readily permeable to roots, air, and water and responds well to good management. All crops, including alfalfa, pasture, and nursery stock, produce satisfactory yields if the soil is heavily fertilized and otherwise is well managed. (Capability unit IIe–1; woodland suitability group 2)

Etowah silt loam, 5 to 12 percent slopes (EwC).—This deep, well-drained soil formed in alluvium 5 to 12 feet thick. The surface layer of dark-brown, friable silt loam is 4 to 7 inches thick and is underlain by a subsoil of yellowish-red, red, or reddish-brown friable silty clay loam that extends to a depth of 3 to 4 feet. The depth to limestone bedrock is commonly more than 10 feet. In small eroded spots the subsoil is exposed.

This soil is medium acid or strongly acid, moderate in natural fertility, and high in available water capacity. Good tilth is easy to maintain, except in a few patches where the subsoil is exposed. The soil is permeable to roots and water and responds well to management.

This productive soil is well suited to all of the crops commonly grown, including alfalfa and nursery stock. Because it is sloping and susceptible to erosion, however, it is not suitable for row cropping year after year. (Capability unit IIIe–1; woodland suitability group 2)

Etowah silt loam, 12 to 20 percent slopes (EwD).—This soil is in small areas, mainly on the foot slopes of the Cumberland Plateau escarpment. The surface layer is dark-brown, friable silt loam 7 to 10 inches thick. The subsoil is yellowish-red, reddish-brown, or red, friable silty clay loam that extends to a depth of about 60 inches. The depth to limestone bedrock ranges from 5 to 25 feet. Included with this soil in mapping are some severely eroded areas.

This soil is moderate in natural fertility, medium acid or strongly acid, and high in available water capacity. It is easily kept in good tilth. The subsoil is readily permeable to roots and water.

Hay and pasture crops make excellent growth if this soil is well managed, and alfalfa grows well if lime and fertilizer are added in amounts indicated by soil tests. Also suited under good management are nursery stock and all other crops commonly grown. (Capability unit IVe–1; woodland suitability group 2)

Etowah cherty silt loam, 5 to 12 percent slopes (EtC).—This brown, fertile soil is in tracts of 2 to 15 acres, mainly on the foot slopes of the Cumberland Plateau escarpment. It developed in material that washed from slopes of the Cumberland Mountains and then settled in the adjoining valley. Fragments of chert, as much as 6 inches across, are on the surface and throughout the profile. Limestone rock underlies practically all areas at a depth ranging from 5 to 25 feet.

The main layers of a typical profile are—

0 to 8 inches, dark-brown, friable cherty silt loam.
8 to 40 inches, yellowish-red or reddish-brown, friable cherty silty clay loam.
40 to 60 inches, red, firm clay or cherty clay.

Below a depth of 40 inches, some areas of this soil have a layer of cherty or gravelly silty clay loam that, in some places, is mottled with shades of yellow. In a few places the depth to limestone rock is less than 5 feet.

Although the fragments of chert cause some difficulty in tillage, this soil is productive. It has a deep, well-aerated root zone and responds well to fertilization and other good management. Except for the chert, the soil is easy to work, and crops ordinarily form good stands.

Yields of all the common crops are at least adequate, and if rainfall is adequate, they are favorable. Vegetable crops and nursery crops are especially well suited. (Capability unit IIIe–1; woodland suitability group 2)

Etowah cherty silt loam, 12 to 20 percent slopes (EtD).—This well-drained, productive soil is on fairly long slopes on or near the foothills of the Cumberland Plateau escarpment. Normally, it has a surface layer of dark-brown, friable cherty silt loam, 8 inches thick, and a subsoil of reddish-brown or yellowish-red, friable cherty silty clay loam 3 to 5 feet thick. Chert fragments 2 to 8 inches across make up 15 to 25 percent of the soil, by volume. Some areas that are slightly eroded have a dark-brown surface layer 5 or 6 inches thick. The old alluvium in which the soil formed is underlain by limestone bedrock at a depth of 5 to 25 feet.

This soil has a thick root zone, is productive, and responds well to good management. Fragments of chert interfere somewhat with tillage, but use of the soil is limited more severely by moderately steep slopes than by chert fragments. All crops produce satisfactory yields, but row crops can be safely grown only in a long cropping system. Favorable yields are obtained from all the common plants grown for pasture. (Capability unit IVe–1; woodland suitability group 2)

Etowah cherty silt loam, 20 to 30 percent slopes (EtE).—This deep, well-drained soil is mostly on long slopes next to the Cumberland Plateau escarpment. It formed in old material that was washed from the Cumberland Mountains and deposited in the valleys. It has a surface layer of dark-brown, friable cherty silt loam, 6 to 10 inches thick, and a subsoil of yellowish-red or reddish-brown cherty silty clay loam that is friable and easily penetrated by roots. Limestone rock occurs at a depth of 5 to 25 feet.

This soil is too steep for cultivation, but it would produce satisfactory yields of row crops if runoff could be controlled. Its best use probably is pasture, which is highly productive. Among the pasture plants that make excellent growth are orchardgrass, bluegrass, tall fescue, alfalfa, white clover, and lespedeza. The soil also is excellent for trees. (Capability unit VIe–1; woodland suitability group 2)

Gullied Land

Gullied land (Gd) consists of areas, generally 5 acres or less in size, that are gullied so severely that they cannot be crossed by ordinary farm machinery. These areas are more than 60 percent gullies ranging from 1 to 10 feet in depth. Between the gullies are remnants of the original soils; practically all of the original surface layer and much of the subsoil have been lost through erosion. Before erosion destroyed these soils, they were of the Waynesboro, Christian, Talbott, Allen, and Baxter series. Slopes

range from 10 to 40 percent. Limestone crops out in many places.

Most areas of Gullied land are best used as forest, but some of the less deeply cut areas are fairly suitable for pasture if they are first smoothed and then properly fertilized and seeded. (Capability unit VIIe-2; woodland suitability group 13)

Guthrie Series

In the Guthrie series are poorly drained, gray, silty soils that formed in silty material, or loess. These soils occur on broad flats and in slight depressions on nearly level uplands.

The main layers of a typical profile are—

0 to 8 inches, gray, friable silt loam mottled with olive brown.
8 to 24 inches, light-gray, friable silt loam mottled with olive brown.
24 to 36 inches, light-gray silt loam or silty clay loam; compact and brittle.

Guthrie silt loam (0 to 2 percent slopes) (Gu).—This gray, wet soil is on upland flats and in slight depressions that commonly lack a drainage outlet. The surface layer is gray silt loam 8 to 10 inches thick, and the subsoil is light-gray silt loam that is friable in the upper part and compact in the lower. Underlying the subsoil, at a depth of about 2 feet, is a fragipan. Limestone bedrock is more than 10 feet below the surface in most places.

This soil has very slow surface drainage and is covered with standing water in winter and spring. The fragipan is dense and slowly permeable to moisture, and it nearly blocks the penetration of air and roots. In dry periods, however, the soil is extremely droughty. It is strongly acid, is low in natural fertility, and does not respond well to fertilization.

This soil is used mainly for pasture or as woodland. It produces medium yields of soybeans, tall fescue, and other water-tolerant crops. Because of slow permeability and lack of outlets, artificial drainage is difficult and expensive. (Capability unit IVw-1; woodland suitability group 11)

Hartsells Series

The Hartsells series consists of well-drained, loamy soils on gently rolling uplands of the Cumberland Plateau. These soils formed in material weathered from acid sandstone. Slopes range from 2 to 12 percent but are less than 5 percent in most places.

The main layers of a typical profile are—

0 to 8 inches, brown, friable loam.
8 to 30 inches, yellowish-brown, friable clay loam to loam.

The depth to bedrock ranges from 2½ to 7 feet.

Hartsells loam, 2 to 5 percent slopes (HaB).—This well-drained, loamy soil is on the Cumberland Plateau. The surface layer is brown, friable loam 6 to 8 inches thick. The subsoil is 20 to 30 inches thick and, in most places, is yellowish-brown, friable clay loam, though it ranges from clay loam to loam. The depth to sandstone bedrock generally ranges from 2½ to 7 feet. In about 15 percent of the acreage, the soil has yellowish-red or red, friable clay loam at a depth of 24 to 48 inches and, in these places, is underlain by sandstone rock at a depth of 4 to 7 feet. This part of the acreage is slightly more productive and has a higher available water capacity than the rest.

Included in mapping are some areas that have a sandy loam surface layer. In addition, Linker soils occur in small included areas, as much as one-fourth acre in size, that make up 10 to 15 percent of the total acreage.

This soil is easy to keep in good tilth and can be cultivated within a wide range of moisture content without forming clods or crusts. Permeability is moderately rapid in both the surface layer and subsoil, and the available water capacity is high. The soil is strongly acid and low in natural fertility, but it responds well to liming and fertilization. In some areas, however, the feeding zone for deep-rooted legumes is somewhat limited by shallowness to bedrock.

Only a small part of this soil has been cleared; it is used for nursery stock, pasture, and corn. In addition to these crops, the soil is suited to other field crops and to vegetables. Unless lime and fertilizer are added, however, yields are low. In contrast with most soils at lower elevations, the response of this soil to heavy fertilization increases with the frequency of showers during the growing season. (Capability unit IIe-2; woodland suitability group 4)

Hartsells loam, 5 to 12 percent slopes (HaC).—Nearly all of this loamy, well-drained soil is in wooded areas on short upland slopes of the Cumberland Plateau. The surface layer is brown, friable loam 6 to 8 inches thick, and the subsoil is yellowish-brown, friable clay loam or loam that extends to a depth of about 2 feet. The subsoil generally lies directly on bedrock but, in some places, is underlain by 1 to 2 feet of red, friable clay loam. In some areas mapped as this soil the surface layer is sandy loam.

This soil is strongly acid and is low in natural fertility. It is permeable to water, is readily penetrated to bedrock by plant roots, and is easily worked and kept in good tilth. The available water capacity is moderately high.

If large amounts of fertilizer are added to this soil, practically all crops grow well. Because the soil is rather shallow, however, and because its use for crops is limited mainly by slope, controlling erosion is important. (Capability unit IIIe-2; woodland suitability group 4)

Huntington Series

The soils in the Huntington series are deep, friable, and well drained. They formed in sediments that were recently deposited on nearly level bottom lands, along narrow drainageways, and in small depressions. Slopes range from 0 to 2 percent.

The main layers of a typical profile are—

0 to 28 inches, dark-brown, friable silt loam.
28 to 48 inches, brown, friable silt loam with a few gray mottles.

In this county the texture of the surface layer is dominantly silt loam but is cherty silt loam in a small acreage.

Huntington silt loam (0 to 2 percent slopes) (Hu).—This is a deep, friable, well-drained soil on nearly level first bottoms and in small depressions. Slopes generally are 0 to 2 percent, but they range from 10 to 25 percent along streambanks that are too narrow to be mapped separately. This soil consists of dark-brown or brown, friable silt loam that extends to a depth of at least 3 or 4 feet and, in places, is underlain by gravelly or sandy layers. The depth to bedrock ranges from 5 to 25 feet. Included with this soil are areas that have a loam surface layer.

Huntington silt loam is medium acid or slightly acid throughout and is high in natural fertility. It has a deep, permeable root zone that is well aerated and supplies a large amount of water to plants throughout the year. The soil is seldom ponded or flooded for long periods, but in some areas there is occasional overflow during the growing season.

Row crops can be grown year after year if precautions are taken to maintain good tilth by returning crop residue to the soil. Ordinarily, lime is not required. (Capability unit I-1; woodland suitability group 1)

Huntington cherty silt loam (0 to 2 percent slopes) (Hr).—This soil is along small streams on the Highland Rim. Slopes are 0 to 2 percent in most places, but they range from 10 to 25 percent along streambanks. On and in the soil are many fragments and waterworn pebbles of chert, 1/4 inch to 3 inches across, that generally make up 10 to 25 percent of the soil, by volume. Some areas are as much as 40 percent chert. The underlying material ranges from cherty silt loam to cherty clay. In some areas below a depth of 20 inches there is a layer of yellowish-brown, friable cherty silty clay loam. A few spots are more cherty than typical because the chert has accumulated locally or has been left when overflowing streams scoured away the finer particles of soil.

Although the chert is bothersome, this soil is easy to work and responds well to management. It is slightly acid to medium acid, low in phosphorus, and moderately low in potassium.

This soil is suitable for intensive cultivation; it produces medium yields of nearly all crops. Areas occasionally flooded, however, are not well suited to small grain, alfalfa, and similar crops that are damaged by flooding in winter and spring. (Capability unit IIs-1; woodland suitability group 1)

Jefferson Series

The Jefferson series consists of deep, well-drained, light-colored, loamy soils on high stream terraces and on mountain foot slopes. These soils formed in alluvium that washed from soils derived from sandstone and limestone. Slopes range from 2 to 20 percent.

The main layers of a typical profile are—

0 to 9 inches, brown, friable loam.
9 to 45 inches, yellowish-brown, friable clay loam or loam.
45 to 56 inches, yellowish-brown, friable clay loam.

The alluvium ranges from 2 1/2 to 15 feet in thickness and is underlain by red clay or cherty clay several feet thick. In a few places there are quartzite pebbles and sandstone cobbles mixed in the soil profile.

Jefferson loam, 2 to 5 percent slopes (JeB).—This light-colored, well-drained, loamy soil formed in alluvium. It has a brown, friable loam plow layer and generally a yellowish-brown, friable clay loam subsoil that is several feet thick. Some areas have a few quartzite pebbles on the surface and throughout the profile. Included with this soil are some areas that have a sandy loam surface layer. The texture of the subsoil ranges from loam to clay loam. A few areas are on benches and foot slopes of the Cumberland Plateau escarpment.

This soil is very strongly acid and low in natural fertility. Permeability is rapid in the surface layer and moderately rapid in the subsoil. The available water capacity is high. The soil is easy to keep in good tilth and can be cultivated within a wide range of moisture content without forming clods or crusts.

This soil is well suited to all crops grown locally, including nursery stock and vegetables, but it produces low or very low yields unless fertilizer is used. If the soil is fertilized according to needs indicated by soil tests and otherwise is well managed, it can produce satisfactory yields of all the common crops. It is an especially good soil for tobacco and vegetable crops because it is easy to work, is easily penetrated by roots, and responds well to management. (Capability unit IIe-2; woodland suitability group 4)

Jefferson loam, 5 to 12 percent slopes (JeC).—This sloping soil is in small areas on rolling hills. It developed in alluvium and is deep, loamy, and well drained. The surface layer is brown, very friable loam 5 to 8 inches thick, and the subsoil is yellowish-brown, friable loam or clay loam several feet thick. The alluvium ranges from 5 to 10 feet in thickness in most places and is underlain by clay or cherty clay derived from limestone. In some fields cultivation has mixed a small amount of subsoil material with the plow layer, but this layer is still friable and easy to work.

This soil is strongly acid and low in natural fertility, but it responds well to fertilization. It is permeable, has a deep root zone, and is high in available water capacity.

All the common crops produce satisfactory yields if fertilization is heavy. Row crops are productive but should be used only in a long cropping system. (Capability unit IIIe-2; woodland suitability group 4)

Jefferson loam, 12 to 20 percent slopes (JeD).—This deep, well-drained soil developed in alluvium on hillsides. It has a brown, very friable surface layer, 5 to 8 inches thick, and a yellowish-brown, friable clay loam subsoil. Some fields have small, yellowish spots where the original surface layer has washed away and the yellow subsoil is exposed. In some places small sandstone pebbles are on the surface and throughout the profile.

This soil is strongly acid and very low in fertility, but when it is fertilized, it produces high yields. The root zone is deep and permeable, and roots grow to an unlimited depth. The available water capacity is high.

This soil is too steep for frequent row cropping, but it can be used for row crops in a long cropping system. It is suitable for pasture and produces economic yields. Among the pasture plants that grow well are orchardgrass, tall fescue, bermudagrass, white clover, and lespedeza. For favorable yields of crops and pasture, large additions of lime and a complete fertilizer are needed. (Capability unit IVe-1; woodland suitability group 4)

Jefferson loam, 12 to 20 percent slopes, severely eroded (JeD3).—This severely eroded soil is in small tracts on short hillsides. It is a deep, loamy, light-colored soil that formed in old alluvium. The present surface layer generally is yellowish-brown, friable loam, but it ranges to clay loam in some places. This layer consists largely of subsoil material, for the original surface layer has been washed away. The subsoil is yellowish-brown clay loam that is friable and easily penetrated by roots. Because the subsoil is loamy and tends to wash out in large chunks, gullies are easily formed in this soil, and some fields have a few shallow ones. In a number of places there are many

small sandstone pebbles on the surface and throughout the soil.

This soil is moderately steep and is severely affected by erosion, but it can be put to profitable use. The plow layer, though chiefly material from the subsoil, can be worked into a good seedbed. Yields of row crops are only medium, but pasture yields are favorable if the soil is limed, heavily fertilized with a complete fertilizer, and well managed in other respects. Plants suitable for pasture are tall fescue, orchardgrass, white clover, bermudagrass, and lespedeza. (Capability unit VIe–1; woodland suitability group 4)

Jefferson cobbly sandy loam, 5 to 20 percent slopes (JsD).—This well-drained, friable, loamy soil formed in alluvium, mainly on foot slopes and benches in the mountains. It has a surface layer of brown cobbly sandy loam about 8 inches thick, and a subsoil of yellowish-brown, friable cobbly loam or cobbly clay loam. The depth of the alluvium normally ranges from 2½ to 10 feet. On the surface and throughout the profile are many sandstone fragments 3 to 10 inches across.

This soil is very low in natural fertility and is strongly acid. It is permeable and easily penetrated by roots. Although it absorbs rainfall quickly, it has low available water capacity because it is porous and cobbly.

Most of this soil remains wooded, but some has been cleared. Several areas are used for pasture, and some mildly sloping areas are used for row crops and nursery crops. Because the steeper slopes are erodible and difficult to cultivate, they are not suited to row crops. Areas having slopes of less than 12 percent are moderately well suited to row crops, but cobbles interfere with cultivation. Satisfactory yields of pasture can be obtained by applying adequate amounts of lime and a complete fertilizer. (Capability unit VIs–1; woodland suitability group 4)

Lawrence Series

The Lawrence series consists of somewhat poorly drained, silty soils on slopes of 0 to 2 percent. These soils are around the rim of large wet depressions, on nearly level upland plains, and along intermittent drains on the Highland Rim. They formed in 2 to 4 feet of loess that is underlain by clay or cherty clay derived from limestone. Bedrock is 15 to 30 feet below the surface.

The main layers of a typical profile are—

0 to 8 inches, grayish-brown, friable silt loam.
8 to 22 inches, light brownish-gray, friable silt loam mottled with yellowish brown and grayish brown.
22 to 45 inches, gray, compact silt loam mottled with shades of brown and gray.

Lawrence silt loam (0 to 2 percent slopes) (Lo).—This somewhat poorly drained, silty soil is in depressions and along small drainageways on the Highland Rim. It has a grayish-brown, friable silt loam surface layer that is about 8 inches thick and is underlain by a mottled gray and yellow, friable silt loam subsoil. At a depth of about 20 to 22 inches, the subsoil is underlain by a compact fragipan, 10 to 25 inches thick, that is very slowly permeable. Below the pan is mottled yellowish-red and gray clay or silty clay loam containing a variable amount of chert. Limestone bedrock is 15 to 30 feet from the surface.

This soil is strongly acid throughout and is very low in natural fertility. During wet periods it is saturated because the water table is held near the surface by the fragipan. Surface runoff is slow or very slow, and in places the soil is ponded after rains. The moisture supply is undependable, because the root zone is only 1 to 2 feet thick and water is available to plants only in that part of the soil. After it dries out in spring, this soil is easy to work.

About two-thirds of the acreage has been cleared and is commonly used for pasture. Slow internal drainage is the main limitation to use, but an effective drainage system is ordinarily difficult to install because many areas are in depressions that have no outlet. Tiling does not work well, because water moves so slowly through the subsoil, but ditching that removes excess surface water is effective.

If lime and a complete fertilizer are added in large amounts, this soil produces satisfactory yields of soybeans and other crops that can be planted late. In addition, it produces favorable yields of water-tolerant grasses and legumes such as tall fescue and white clover. Small grain can be grown in places where the surface water is removed, but the soil is too wet for alfalfa, tobacco, vegetable crops, and nursery crops. (Capability unit IIIw–2; woodland suitability group 11)

Lindside Series

The Lindside series consists of moderately well drained and somewhat poorly drained, loamy soils on bottom lands. These soils formed in alluvium that recently washed from soils on uplands and terraces that were derived mostly from limestone. In Warren County the Lindside soils are scattered throughout the Highland Rim.

The main layers of a typical profile are—

0 to 15 inches, dark-brown, friable silt loam.
15 to 30 inches, mottled gray and brown, friable silt loam or silty clay loam.
30 to 48 inches, gray or dark-gray silt loam or silty clay loam mottled with yellowish brown and light brownish gray.

Lindside silt loam (0 to 2 percent slopes) (Ln).—This is a moderately well drained and somewhat poorly drained, loamy soil on first bottoms, in depressions, and in narrow strips along drainageways. To a depth of 15 inches, the soil is dark-brown, friable silt loam. Below this layer and extending to a depth of about 30 inches is mottled gray and brown silt loam or silty clay loam. In most places the soil is gray below a depth of 30 inches. In some of the narrow drainageways there is a small amount of chert fragments on the surface and throughout the profile. Included with this soil are a few areas that have a surface layer of loam or sandy loam.

Lindside silt loam is one of the most productive and most fertile soils in the county. Ordinarily, it does not require lime. It is very high in available water capacity and responds well to management. Most areas, however, are flooded occasionally, especially in winter and spring. During these seasons, practically all areas have a high water table and are subject to moderate damage from overflow.

This soil is suitable for cultivation every year and produces favorable yields of many kinds of crops. It is especially valuable for crops that grow in summer, such as corn, soybeans, and grain sorghum, and for supplemental pasture crops, such as sudangrass. It is an excellent soil for pasture but is a little too wet for alfalfa. Growing

tobacco is risky. (Capability unit IIw-1, woodland suitability group 1)

Linker Series

The Linker series consists of friable, well-drained, loamy soils on the Cumberland Plateau. These soils occupy slopes of 2 to 12 percent on gently rolling uplands, where they formed in material weathered from acid sandstone.

The main layers of a typical profile are—

0 to 8 inches, brown, friable loam.
8 to 40 inches, yellowish-red or red, friable clay loam.
40 to 60 inches, red, friable clay loam or sandy clay loam.

The depth to sandstone bedrock ranges from 2½ to 8 feet.

Linker loam, 2 to 5 percent slopes (LrB).—This soil occupies gently sloping areas of the Cumberland Plateau. It formed in material weathered from acid sandstone and is well drained, friable, and loamy. The surface layer is brown, friable loam about 8 inches thick. The subsoil is red or yellowish-red, friable clay loam that generally extends nearly to sandstone bedrock. The depth to sandstone ranges from 3 to 8 feet. Ordinarily, there is a 6-inch layer of sandy clay loam or sandy loam directly above bedrock.

In some areas the reddish subsoil is nearly 2 feet below the surface, and the soil above it is yellowish-brown or brown loam. In these areas the original surface layer appears to be covered with a few inches of loess.

This soil is strongly acid and very low in natural fertility, but it responds well to fertilization, liming, and other good management. The available water capacity is high, and roots can easily penetrate the loamy subsoil to bedrock. The soil is easy to keep in good tilth and to work with farm machinery.

Only about 5 percent of this soil has been cleared. The cleared acreage is in a few fields used mainly for nursery stock. All the common crops are suited, and yields are satisfactory if large amounts of lime and a complete fertilizer are added. (Capability unit IIe-2; woodland suitability group 4)

Linker loam, 5 to 12 percent slopes (LrC).—This is a well-drained, friable, loamy soil on the Cumberland Plateau. It has a brown, friable loam surface layer, 6 to 8 inches thick, and a yellowish-red or red, friable clay loam subsoil. The depth to acid sandstone bedrock is 3 to 7 feet.

This soil is strongly acid and low in natural fertility. Its root zone is fairly thick, and roots can easily penetrate the loamy subsoil. The soil has high available water capacity, is easy to keep in good tilth, and is easy to work with farm machinery.

Almost all the acreage is still wooded, but the soil is well suited to cultivated crops, nursery stock, hay crops, and pasture. It responds especially well to liming, fertilization, and other good management. (Capability unit IIIe-2; woodland suitability group 4)

Melvin Series

In the Melvin series are gray, poorly drained soils on nearly level first bottoms. These soils are scattered throughout the Highland Rim, generally on the outer rim of the flood plain. In places they occupy the entire bottom along some of the smaller streams and the intermittent drainageways.

The main layers of a typical profile are—

0 to 8 inches, grayish-brown, friable silt loam.
8 to 48 inches, gray silt loam or silty clay loam mottled with shades of brown and yellow.

Most areas of Melvin soils are flooded for a few days nearly every winter and spring.

Melvin silt loam (0 to 2 percent slopes) (Me).—This is a gray, poorly drained soil on nearly level bottom lands. In most places it occurs on the outer rim of the flood plain, but in places it occupies the entire bottom along some of the smaller streams and the intermittent drainageways. The surface layer is a grayish-brown, friable silt loam that is about 8 inches thick and is faintly mottled with gray. Below this layer is a subsoil that is several feet thick and generally consists of gray silt loam or silty clay mottled with shades of brown and yellow. In a few areas the subsoil is black silty clay loam.

This soil is medium acid or slightly acid and ordinarily does not require lime. Surface runoff and internal drainage are slow or very slow, and most areas are flooded for a few days each winter and spring. Plant roots do not penetrate deeply, for the lower part of the profile is saturated with water and is poorly aerated much of the time. Tile or open ditches can be used to drain this soil, however, because the subsoil is permeable and water drains through it at a favorable rate.

A large part of this soil has been cleared, and much of it is in pasture consisting of volunteer plants common to wet areas. Unless the soil can be drained, it is suited to only a few crops, for where it is used for corn and other row crops, flooding commonly damages or drowns out the stand. Adequate yields are obtained from soybeans, grain sorghum, and other crops that can be planted late. Also adequate are yields of tall fescue, white clover, and other water-tolerant plants used for pasture. (Capability unit IIIw-1; woodland suitability group 11)

Minvale Series

The Minvale series consists of well-drained, yellowish-red, loamy soils on foot slopes of the Highland Rim. Slopes range from 2 to 12 percent.

The main layers of a typical profile are—

0 to 8 inches, brown, very friable silt loam.
8 to 50 inches, yellowish-red, friable silty clay loam.
50 inches +, red sticky clay that is cherty in places.

Minvale silt loam, 2 to 5 percent slopes (MnB).—Most areas of this soil are less than 5 acres in size, and most are on foot slopes below Baxter, Christian, and Bodine soils. This soil formed in local alluvium, or slopewash, and is deep and well drained. It has a surface layer of brown, friable silt loam, 5 to 8 inches thick, that is underlain by a subsoil of friable silty clay loam that is 2 to 5 feet thick and is yellowish red or, in a few places, yellowish brown. The depth to limestone bedrock ranges from 5 to 30 feet. A few small fragments of chert occur in most areas.

This soil has a soft, friable subsoil and is deeply penetrated by plant roots. It is high in available water capacity, moderate in natural fertility, and medium acid or strongly acid. The soil is easy to work and responds well to management.

This soil can be used for all crops that are suited to the climate. If it is adequately limed, fertilized and otherwise well managed, it produces favorable yields of row crops, small grain, hay crops, and pasture. (Capability unit IIe–1; woodland suitability group 2)

Minvale silt loam, 5 to 12 percent slopes (MnC).—This well-drained, loamy soil is mostly in tracts of 2 to 5 acres on foot slopes at the base of long upland slopes. The plow layer is 5 to 7 inches of brown, friable silt loam and, in some places, has a small amount of subsoil material mixed into it through cultivation. The subsoil is yellowish-red, moderately friable silty clay loam. In some areas there are a few chert fragments throughout the profile.

This soil is strongly acid, moderately low in natural fertility, and high in available water capacity. Good tilth is fairly easy to maintain, and moisture and roots easily penetrate the surface layer and the subsoil.

All crops commonly grown in the area are suited to this soil, but the slopes are too strong for annual cultivation. Yields are favorable if good management is practiced and if fertilizer and lime are added in adequate amounts. Alfalfa and nursery stock grow well. (Capability unit IIIe–1; woodland suitability group 2)

Mountview Series

The Mountview series consists of well-drained, yellowish, silty soils on gently sloping and rolling uplands of the Highland Rim. These soils formed in a layer of loess, 2 to 3 feet thick, that is underlain by red and yellowish-red cherty clay, cherty silty clay, or clay (fig. 12). The depth to limestone and siltstone bedrock is 8 to 30 feet. Slopes range from 2 to 12 percent.

The main layers of a typical profile are—

0 to 8 inches, brown, very friable silt loam.
8 to 30 inches, yellowish-brown, friable silt loam or silty clay loam.
30 to 50 inches, mottled red and yellow, sticky clay that is cherty in places.

Figure 12.—Profile of a Mountview silt loam. The part of the soil that formed in loess extends to the bottom of the spade and is underlain by cherty clay.

Mountview silt loam, 2 to 5 percent slopes (MoB).—This is a well-drained, light-colored, silty soil on gently sloping uplands of the Highland Rim. It formed in 2 to 3 feet of loess deposited on red clay or cherty clay. The plow layer is brown, friable silt loam, and the subsoil is yellowish-brown, friable silt loam 15 to 25 inches thick. Beneath the subsoil is red and yellowish-red cherty clay or clay that formed in material weathered from limestone. The depth to bedrock is 8 to 30 feet.

In the area of contact between the original mantle of loess and the underlying clay, there is a 6- to 12-inch layer that is mottled with shades of gray and yellow. This mottled layer commonly begins about 30 inches below the surface and extends to a depth of 40 inches. In some places it appears to be a weak pan layer.

This soil is strongly acid and low in natural fertility, but it responds extremely well to additions of lime and a complete fertilizer. The available water capacity is high, and plant roots can easily penetrate to the buried clay layer. Because the surface layer and the subsoil are soft and friable, the soil is easy to work and to keep in good tilth.

This soil produces satisfactory yields of all crops commonly grown in the county, but it requires heavy fertilization. It is especially well suited to tobacco, vegetable crops, and nursery stock, all of which require much cultivating, transplanting, and digging in the soil. Although it is not among the best soils for alfalfa, it can produce medium yields under a high level of management. (Capability unit IIe–2; woodland suitability group 4)

Mountview silt loam, 5 to 12 percent slopes (MoC).—This silty, well-drained soil is on short upland slopes of the Highland Rim. It formed in 2 to 3 feet of light-colored silty material, or loess, that is underlain by several feet of clay or cherty clay derived from limestone. For the most part, the surface layer is brown or pale-brown, very friable silt loam that ranges from 4 to 8 inches in thickness. The subsoil of yellowish-brown, friable silt loam extends to an average depth of 30 inches, where it is underlain by yellowish-red clay or cherty clay. The depth to bedrock is 8 to 30 feet.

In this soil roots and moisture easily penetrate the soft, friable subsoil to the clay layer, but further penetration is slowed. The soil is low in natural fertility and is strongly acid, but it responds very well to additions of lime and a complete fertilizer. It has high available water capacity.

Satisfactory yields of all crops can be produced if the soil is fertilized in amounts determined by soil tests and otherwise is well managed. (Capability unit IIIe–2; woodland suitability group 4)

Mountview silt loam, 5 to 12 percent slopes, severely eroded (MoC3).—Erosion has removed most of the original surface layer from this soil, and plowing has mixed subsoil material with the remaining part of the surface layer. As a result, the plow layer is yellowish-brown silt loam. The subsoil is yellowish-brown silty clay loam or silt loam that is underlain by red or yellowish-red clay or cherty clay at a depth of 15 to 30 inches. The depth to limestone rock ranges from 8 to 30 feet. Rills, and also a few deep gullies, are common in a number of fields. In some places small spots of red cherty clay are exposed in gullies and on the top of hills. Some areas have a few chert fragments on the surface and throughout the profile.

Roots and moisture easily penetrate this soil to the layer of red clay, but further penetration is slow. In places where the clay is within 20 inches of the surface, plants lack moisture in dry periods. The soil is low in natural fertility and is strongly acid, but it responds fairly well to additions of fertilizer and lime. Although the soil is fairly easy to work, it tends to crust after a rain. Runoff is rapid, and the hazard of further erosion is severe.

This soil is of marginal use for cultivation because the choice of suitable crops is narrow and the yields of some crops are low. Yields of small grain are satisfactory, however, for this crop ordinarily matures before moisture is depleted. Hay and pasture crops produce favorable yields if the soil is heavily fertilized and is otherwise well managed. (Capability unit IVe–1; woodland suitability group 4)

Ramsey Series

The Ramsey series consists of loamy, shallow soils on the Cumberland Plateau. These soils formed in material weathered from acid sandstone and, in most places, are moderately steep and steep.

The main layers of a typical profile are—

0 to 7 inches, pale-brown or brown, friable loam or sandy loam.

7 to 17 inches, yellowish-brown, friable loam or sandy loam.

Sandstone bedrock is normally at a depth of 10 to 24 inches, but it crops out in places.

Ramsey loam, 5 to 12 percent slopes (RaC).—This is a shallow, loamy soil that occurs on ridgetops on the Cumberland Plateau and formed in material weathered from acid sandstone. It has a surface layer of brown, friable loam, 6 to 8 inches thick, and a subsoil of yellowish-brown, friable loam or sandy loam, 8 to 12 inches thick. In most places sandstone bedrock is at a depth of 10 to 24 inches, but some areas have a few outcrops of sandstone and a few loose stones. Included with this soil are areas that have a sandy loam surface layer.

This soil is very strongly acid, very low in natural fertility, and low in available water capacity. Surface runoff is rapid, and internal drainage is very rapid.

Nearly all of this soil is forested. It could produce fair yields of pasture, but most areas occur as narrow strips on ridgetops and are too small to be pastured separately. (Capability unit VIe–3; woodland suitability group 9)

Ramsey loam, 12 to 20 percent slopes (RaD).—This soil formed in material weathered from sandstone. It has a surface layer of brown or pale-brown loam, about 7 inches thick, and a subsoil of yellowish-brown loam or sandy loam, about 10 inches thick. In most places the depth to sandstone rock ranges from 10 to 24 inches, but a few places have outcrops of sandstone and a few loose cobbles and stones. In some areas mapped as this soil, the surface layer is sandy loam.

This soil has little potential for crops, and practically all of it is in forest. Cleared areas could produce fair pasture, but yields probably could not justify the cost of clearing. Furthermore, many areas are next to steep slopes that are suited only to trees. (Capability unit VIe–3; woodland suitability group 9)

Ramsey loam, 20 to 30 percent slopes (RaE).—This soil lies along deep, V-shaped drainageways on the Cumberland Plateau. It is loamy, shallow, and excessively drained. Sandstone crops out in a few places, and there are a few loose fragments of sandstone on the surface and in the soil. The surface layer is pale-brown or brown, friable loam 4 to 6 inches thick, and the subsoil is yellowish-brown or strong-brown, friable loam or sandy loam 6 to 18 inches thick. The depth to sandstone rock commonly ranges between 10 and 24 inches.

This soil is all in forest. It is too shallow and too steep for crops, but it could produce medium to low yields of pasture, though the cost of clearing would probably be too high. (Capability unit VIe–3; woodland suitability group 9)

Ramsey very rocky sandy loam, 10 to 20 percent slopes (RcD).—This shallow, very rocky soil is on short slopes of the Cumberland Plateau. Outcrops of sandstone rock occupy 10 to 30 percent of the surface. Some areas have continuous sandstone ledges along the top of the slopes, and there are a few rock outcrops below the ledges. Between outcrops the soil generally ranges from 6 to 20 inches in depth, but in a few small patches, it is as much as 5 feet deep. These small patches consist of soil formed in colluvium, and they make up an estimated 15 percent of the total acreage.

The profile of this soil is somewhat variable from one place to another. In most places the surface layer is brown or dark grayish-brown sandy loam or loam that is 3 to 7 inches thick and is underlain by yellowish-brown or strong-brown sandy loam or loam that extends to bedrock. In a few places, however, the entire profile is dark-brown loam.

Nearly all of this soil is in forest consisting of oaks, pines, and mountain-laurel. (Capability unit VIIs–2; woodland suitability group 9)

Ramsey-Jefferson stony complex, 20 to 45 percent slopes (RfE).—This complex consists mainly of Ramsey soils and Jefferson soils that are so intricately mixed and are in such small areas that they cannot be shown separately on the soil map. About 60 percent is Ramsey soils, 35 percent is Jefferson soils, and the rest is sandstone ledges.

The soils of this complex are on long, steep slopes in the Cumberland Mountains. From 10 to 35 percent of the land surface is sandstone outcrops or is covered by loose stones. At the top of many slopes is a ledge or an escarpment of sandstone, and below it is an accumulation of large stones that were broken from the escarpment and drifted downslope.

In areas where the soil presumably formed in place from rock (Ramsey soil), the surface layer is brown or dark grayish-brown sandy loam or loam, about 6 inches thick. Below this layer is yellowish-brown sandy loam or loam that extends to bedrock, which occurs at a depth of 6 to 24 inches. In addition to rock outcrops, angular fragments of sandstone are on the surface and through the soil.

In areas where the soil formed in local alluvium (Jefferson soil), the surface layer is brown or pale-brown loam or sandy loam, about 8 inches thick. Underlying this layer is yellowish-brown clay loam or loam 2 to 5 feet thick. In most places the soil is stony or cobbly.

Practically all the acreage of this complex is in forest. The soils have little or no potential for crops or pasture, but they are fairly productive of trees. (Capability unit VIIs–2; woodland suitability group 9)

Rock Land

Rock land (Ro) is in larger areas on the Cumberland Plateau escarpment and in small areas on the Highland Rim. It consists mainly of limestone outcrops and very shallow soil material. Ledges of limestone occupy 50 percent of the acreage. In places a thin layer of soil material covers the limestone, but generally this material is only in cracks and crevices. It varies in texture but normally is clay or silty clay. Slopes range from 15 to 45 percent.

Rock land is nearly all in cutover forest. It is too shallow for crops or pasture but is deep enough to support a sparse stand of hardwoods, cedar, and pine. Some of the limestone is used as a source of gravel, agricultural lime, and other products. (Capability unit VIIs-2; woodland suitability group 13)

Sango Series

The Sango series consists of moderately well drained, silty soils that have a fragipan. These soils are mainly in depressions and on foot slopes of the Highland Rim. They formed in 2 to 4 feet of loess that generally is underlain by clay or cherty clay several feet thick. The slope ranges from 1 to 3 percent.

The main layers of a typical profile are—

0 to 8 inches, pale-brown, friable silt loam.
8 to 20 inches, light yellowish-brown, friable silt loam with a few grayish-brown mottles.
20 to 36 inches, mottled gray and brown, compact silt loam.
36 to 48 inches, mottled red and yellow silty clay loam that is cherty in places.

The depth to limestone bedrock is 15 to 30 feet.

Sango silt loam (0 to 2 percent slopes) (Sa).—This moderately well drained, light-colored, silty soil has a fragipan. It occurs in depressions and on foot slopes of the Highland Rim, mostly in tracts of 2 to 3 acres. The soil formed in 2 to 4 feet of loess that is underlain by several feet of clayey soil that is cherty in places. Normally, the surface layer is pale-brown, friable silt loam, about 8 inches thick. The subsoil, to a depth of about 24 inches, is light yellowish-brown, friable silt loam that has a few gray mottles in the lower part. At an average depth of 24 inches is a fragipan of mottled gray and yellow, compact silt loam that extends to a depth of 40 inches. In places the pan is weakly developed or absent. The depth to bedrock is 15 to 30 feet. The depth to the fragipan ranges from 18 to 30 inches.

This soil is very strongly acid. It is very low in natural fertility and organic-matter content, but it responds well to fertilization. Surface runoff and internal drainage are slow, and the available water capacity is moderate. In the upper 18 to 30 inches, the soil is easily penetrated by roots, water, and air, but the fragipan stops the growth of most roots and slows the movement of water. Consequently, in some years the soil remains saturated until late in spring, and the planting of crops is delayed. In periods of little rainfall the soil is droughty. Because it is soft and friable, it is easy to work.

About half of this soil remains wooded, and the rest is in corn, soybeans, lespedeza, and pasture. Most crops produce moderate yields, though alfalfa and tobacco are not well suited, because the lower subsoil is occasionally waterlogged. (Capability unit IIe-3; woodland suitability group 7)

Sequatchie Series

In the Sequatchie series are deep, loamy, friable, well-drained soils that are among the most productive in the county. These soils formed in alluvium on low stream terraces and in mountain coves. Slopes range from 0 to 12 percent but commonly are 1 to 3 percent.

The main layers of a typical profile are—

0 to 10 inches, dark-brown friable loam.
10 to 40 inches, brown or reddish-brown, friable clay loam or loam.
40 to 60 inches, brown, friable loam or sandy loam.

The alluvium is 6 to 15 feet thick. Below a depth of 36 inches, there are many water-rounded pebbles and, in places, some gray mottles.

Sequatchie loam, 0 to 2 percent slopes (SeA).—This nearly level, well-drained, loamy soil is on low stream terraces and is one of the most productive soils in the county. It has a dark-brown, friable loam plow layer and a brown loam or clay loam subsoil. The thickness of the alluvium is 6 to 15 feet. Water-rounded pebbles are below a depth of 36 inches.

This soil is medium in natural fertility and is medium or strongly acid throughout, but it responds extremely well to liming and fertilization. It is permeable to roots and water, has high available water capacity, and is easy to work within a wide range of moisture content.

Nearly all the acreage is in cultivation. Corn (fig. 13), tobacco, small grain, hay crops, and pasture are grown. Except for occasional flooding, which occurs in a few areas for a short time in winter or spring, the soil imposes no limitations on use and can be row cropped every year. (Capability unit I-1; woodland suitability group 1)

Sequatchie loam, 2 to 5 percent slopes (SeB).—This gently sloping, loamy soil is deep, well drained, and productive. It formed in alluvium on low stream terraces, mostly in mountain coves and along large streams. It has a dark-brown plow layer and a brown clay loam or

Figure 13.—**A field of Sequatchie loam, 0 to 2 percent slopes, used for corn. On the left is an area of poorly drained Melvin silt loam under grasses and willows.**

loam subsoil. The alluvium is 6 to 15 feet thick. In places below the subsoil are gravelly layers. About 10 percent of the acreage consists of included areas that have a silt loam surface layer and a silty clay loam subsoil.

This soil is medium acid or strongly acid. It is permeable, is well aerated, has a thick root zone, and is high in available water capacity. It is easily plowed and can be worked within a wide range of moisture content.

This soil produces favorable yields of all the common crops, and nearly all of it is cultivated. (Capability unit IIe-1; woodland suitability group 1)

Sequatchie loam, 5 to 12 percent slopes, eroded (SeC2).—This soil is on short, narrow slopes at the edge of low terraces along the major streams, especially in the coves of the Cumberland Plateau. It has a surface layer of dark-brown loam, about 7 inches thick, and a subsoil of brown friable clay loam, about 30 inches thick. Below the subsoil are faintly mottled layers of clay loam and gravelly clay loam. The alluvium is 6 to 20 feet thick. Yellowish-brown gravelly layers are exposed in some severely eroded areas.

This soil is moderately high in natural fertility and in available water capacity, and it responds well to fertilization. It is easily plowed and can be worked within a wide range of moisture content. All of the commonly grown crops are suited. (Capability unit IIIe-1; woodland suitability group 1)

Staser Series

The Staser series consists of well-drained, sandy loams on bottom lands. The main layers of a typical profile are—

0 to 12 inches, dark-brown, very friable sandy loam.
12 to 48 inches, brown, very friable sandy loam or loam.

Staser sandy loam, 0 to 2 percent slopes (StA).—This deep, loamy soil occurs on long, nearly level first bottoms near streams and in upland depressions. The surface layer is 12 to 15 inches of friable sandy loam that is dark brown or, in some places, reddish brown. The underlying material, to a depth of 30 to 36 inches, is brown or dark-brown, very friable sandy loam or loam. Below a depth of 36 inches is brown or dark-brown, friable loam that has a few gray mottles. Rounded quartz pebbles and chert fragments are common in the lower part of the profile.

This soil is easily kept in good tilth and can be worked throughout a wide range of moisture content without clodding or crusting. It is readily permeable to roots and moisture. It is slightly or medium acid, moderately high in natural fertility, and high in available water capacity.

This soil is used for corn, small grain, hay, pasture, and other suitable crops. In some areas corn is grown every year. Crop yields are favorable if phosphate, potash, and nitrogen are applied in adequate amounts. Little or no lime is needed. Flooding occasionally damages crops and makes a few low areas unsuitable for small grain. (Capability unit I-1; woodland suitability group 1)

Staser sandy loam, 10 to 25 percent slopes (StD).—This deep, sandy soil occurs on steep, narrow streambanks, mostly along the Collins River. It consists of brown, very friable sandy loam 3 to 6 feet thick. Some of the soil is in layers of sandy and silty material that contain spots of gravel. Limestone crops out on some of the steeper banks.

Nearly all of this soil is covered with trees, mainly with hardwoods but also with some pine and redcedar. The soil is moderate in natural fertility and, if cultivated, would be easy to keep in good tilth. Because it is steep and subject to flooding, however, it generally should remain forested or be used for pasture. If the surface were left unprotected, rapidly flowing streams would wash and cut the banks when the water was high. (Capability unit VIe-1; woodland suitability group 1)

Stony Colluvial Land

Stony colluvial land (Su) is on long talus slopes of the Cumberland Plateau escarpment. It extends from immediately below the sandstone ledges of the plateau, at an elevation of about 1,900 feet, to the Highland Rim at about 1,100 feet. Many loose stones and sandstone boulders, some as large as 6 feet across, occupy 20 to 60 percent of the land surface. Much of the very stony material is underlain by limestone bedrock. Slopes range from 5 to 30 percent.

The soil material between the stones varies in depth, color, and texture; the main textures are loam and sandy loam. The depth to bedrock ranges from 2 to 20 feet.

Stony colluvial land is in large areas, and most of it is in forest, its best use. It is extensive and important to forestry in Warren County. Many kinds of trees grow at rates above average, especially on north- and east-facing slopes. (Capability unit VIIs-2; woodland suitability group 12)

Swaim Series

The Swaim series consists of well drained and moderately well drained, clayey soils on foot slopes and benches. These soils formed in local alluvium that washed from soils on uplands derived from limestone.

The main layers of a typical profile are—

0 to 6 inches, brown, friable silt loam.
6 to 24 inches, yellowish-brown or yellowish-red, plastic silty clay or clay that is mottled with shades of gray in the lower part.
24 to 50 inches, mottled red, yellow, and gray, plastic clay.

Limestone bedrock is 3 to 10 feet below the surface. Slopes range from 3 to 10 percent.

Swaim silt loam, 3 to 10 percent slopes, eroded (SwC2).—This is a clayey soil on foot slopes and benches of the Cumberland Plateau escarpment. It formed in local alluvium that washed from rocky soils derived from limestone. The plow layer is brown, friable silt loam or silty clay loam. The subsoil, to a depth of 24 to 30 inches, is yellowish-red or yellowish-brown silty clay or clay that is slightly mottled with yellow, red, and gray. Limestone bedrock is 3 to 10 feet below the surface. In places chert is on the surface and in the profile.

This soil is strongly acid, low in natural fertility, and low in available water capacity. Surface runoff is medium to rapid, and internal drainage is slow. Good tilth is difficult to maintain because the soil puddles if plowed when too wet and forms clods if plowed when too dry.

Most of this soil has been cleared and is in pasture and crops, mainly corn and lespedeza. A small acreage is in native hardwoods. The soil is suited to pasture, small grain, and hay crops, but if cultivated, it is subject to further erosion through surface runoff from nearby mountain slopes. Because the available moisture capacity is low, the response to good management is limited. Yields of row crops are only fair, even if the soil is well fertilized. (Capability unit IVe-2; woodland suitability group 6)

Talbott Series

In the Talbott series are well-drained, clayey soils that formed in material weathered from limestone. In Warren County these soils are on slopes ranging from 5 to 30 percent and are mostly in small areas at the base of the Cumberland Plateau escarpment.

The main layers of a typical profile are—

0 to 7 inches, brown, friable silt loam or silty clay loam.
7 to 30 inches, yellowish-red, plastic clay that is mottled in the lower part.
30 to 42 inches, mottled red, yellow, and brown, plastic clay.

Limestone bedrock lies at an average depth of 2 to 5 feet, but most areas have many outcrops.

Talbott silt loam, 5 to 12 percent slopes (TaC).—This well-drained clayey soil formed in material weathered mainly from limestone. Most of it is in small areas on slopes of the Cumberland Mountains. The soil has a brown, friable silt loam surface layer, about 6 inches thick, and a yellowish-red, plastic clay subsoil. Below a depth of about 24 inches, the subsoil is mottled red, yellow, and brown, plastic clay. Ordinarily, limestone bedrock is 2 to 5 feet below the surface, but it crops out in some places.

Included with this soil are a few eroded areas. On the upper slopes of the Cumberland Mountains, the soil formed from reddish shale.

This soil is strongly acid, low in natural fertility, and low in available water capacity. Surface runoff is rapid or very rapid, and permeability is moderately slow. Because the soil is fine textured and firm, it is difficult to plow and it forms clods if plowed when too wet or too dry. The firm clay subsoil retards the penetration of roots.

About 20 percent of the acreage has been cleared and is planted to crops and pasture. The soil produces low yields of row crops, even if well fertilized, but it produces medium yields of small grain, hay, and pasture. (Capability unit IVe-2; woodland suitability group 6)

Talbott very rocky complex, 5 to 20 percent slopes, eroded (TrC2).—Most areas of this complex are near the base of the Cumberland Plateau escarpment. Ledges and outcrops of limestone occupy 10 to 25 percent of the surface, and there are loose fragments on the surface in many places. Between the rocks is clayey soil that ranges from a few inches to 36 inches in thickness. In these places the surface layer is brown, plastic silty clay loam and the subsoil is yellowish-red or mottled yellow and red, plastic clay.

Most of this complex is in forest consisting of hardwoods and some redcedar. The forests have been cut over several times, and few trees are of merchantable size. The complex is best suited to trees, but a few of the less rocky areas may provide a small amount of grazing in spring. (Capability unit VIIs-2; woodland suitability group 13)

Talbott very rocky complex, 20 to 30 percent slopes, eroded (TrE2).—This complex occurs mainly on the escarpment of the Cumberland Plateau. Outcrops of limestone bedrock occupy 10 to 25 percent of the surface, and fragments of loose limestone are on the surface in many places. Between the rocks the clayey soil ranges from a few inches to 3 feet in thickness. It is sticky and plastic when wet.

Most areas of this complex are in cutover hardwoods, but there is some redcedar. Forest is the best use, for crops and pasture are poorly suited. (Capability unit VIIs-2; woodland suitability group 13)

Waynesboro Series

The Waynesboro series consists of deep, well-drained, loamy soils that formed in alluvium several feet thick. Slopes range from 0 to 30 percent.

The main layers of a typical profile are—

0 to 8 inches, brown, friable loam.
8 to 22 inches, yellowish-red, friable clay loam.
22 to 60 inches, red or dark-red, friable clay loam.
60 to 90 inches, mottled red, yellow, and brown, friable clay loam.

Some areas contain chert and quartzite gravel.

Waynesboro loam, 0 to 2 percent slopes (WaA).—This nearly level, well-drained, loamy soil formed in alluvium on broad, high plains of the Highland Rim. It has a surface layer of brown, friable loam that is 8 to 12 inches thick and is underlain by a subsoil of yellowish-red or red, friable clay loam. In some areas the plow layer is dark brown. Below a depth of 36 inches, the lower part of the subsoil commonly is dark-red clay. The alluvium ranges from 4 to 20 feet or more in thickness and is underlain by limestone rock or by a few to several feet of red clay derived from the limestone.

This soil is strongly acid, low in natural fertility, and high in available water capacity. It is permeable to moisture and roots and can be cultivated through a wide range of moisture content without clodding or puddling. The soil is productive and responds well to management.

This soil is well suited to all crops grown in the county. It produces more favorable yields than other Waynesboro soils because it holds more moisture and has less runoff. It is suitable for row cropping every year or for any other kind of cropping system. (Capability unit I-1; woodland suitability group 3)

Waynesboro loam, 2 to 5 percent slopes (WaB).—This deep, well-drained soil is in medium to small areas, mainly on the top of gently sloping hills in the Highland Rim. It formed in alluvium. The surface layer is brown, friable loam 7 to 10 inches thick, and the subsoil is yellowish-red or red, friable clay loam that changes to dark-red clay at a depth of about 36 inches. In some places the surface layer is silt loam, and in places the subsoil is silty clay loam.

This soil is strongly acid. It has high available water capacity but is low in natural fertility. It is easily penetrated by moisture and roots and responds well to additions of lime and fertilizer. The soil is well suited to all crops grown locally, including truck and nursery crops.

If well managed, it produces favorable yields. (Capability unit IIe–2; woodland suitability group 3)

Waynesboro loam, 5 to 12 percent slopes (WaC).—This well-drained soil is on short slopes and rounded ridgetops. It has a brown, friable loam surface layer, 6 to 9 inches thick, and a red or yellowish-red, friable clay loam subsoil that grades to dark-red clay at an average depth of 3 feet. Limestone bedrock is at a depth of 10 to 25 feet.

Like other Waynesboro soils in the county, this soil is strongly acid, low in natural fertility, and high in available water capacity.

Nearly all the acreage is in stands of mixed hardwoods. If it were cleared, it could be used for all crops grown in the county and, if well managed, would produce economic yields. (Capability unit IIIe–2; woodland suitability group 3)

Waynesboro loam, 5 to 12 percent slopes, eroded (WaC2).—This is the most extensive Waynesboro soil in the county. It occurs on high terraces and is deep, well drained, and loamy. The plow layer is brown or dark-brown, friable loam 4 to 6 inches thick. The subsoil, which is several feet thick, consists of yellowish-red or red, friable clay loam in the upper part and dark-red clay below a depth of 30 to 36 inches. In most fields cultivation has brought a small amount of subsoil material into the plow layer, and a few small red spots occur where the original surface layer has washed away.

This soil is productive, is high in available water capacity, and has a soft, friable subsoil that is easily penetrated by roots. Although the soil is strongly acid and low in natural fertility, its response to liming and fertilization is excellent.

All crops grown in the county are suited to this soil. Slope is the only limitation to use. (Capability unit IIIe–2; woodland suitability group 3)

Waynesboro loam, 12 to 20 percent slopes, eroded (WaD2).—This deep, well-drained, loamy soil developed in alluvium on short hillsides and on slopes that surround sinks. It has a surface layer of brown or dark-brown loam, 5 to 9 inches thick, and a subsoil of yellowish-red or red, friable clay loam that grades to dark-red clay at an average depth of about 30 inches. Many areas have a few eroded spots where the plow layer is red clay loam. A few areas have many rounded pebbles of white quartzite on the surface and throughout the soil.

This soil is moderately high in available water capacity and has a deep, friable root zone. Although it is strongly acid and low in natural fertility, it responds well to additions of fertilizer.

About 10 percent of this soil is in forest. The rest is used mainly for pasture but also for many kinds of crops. The soil can produce satisfactory yields of all the common crops, though it is suitable for cultivation only once in 4 or 5 years. (Capability unit IVe–1; woodland suitability group 3)

Waynesboro loam, 20 to 30 percent slopes (WaE).—This soil is on steep hillsides, mainly in the northeastern part of the county. It is a deep, well-drained, loamy soil that formed in alluvium. The 5- to 9-inch surface layer is brown or dark-brown, friable loam. The subsoil is yellowish-red or red, friable clay loam that generally grades to dark-red clay at a depth of 2 to 3 feet. In cleared areas there are a few eroded spots where the original surface layer has washed away and the red clay loam subsoil is exposed. A few areas contain many rounded pebbles of white quartzite.

About one-third of this soil is in woodlots; most areas are in pasture. The soil can produce satisfactory yields of pasture if it is fertilized and limed according to needs indicated by soil tests. Suitable for planting are orchardgrass, tall fescue, bermudagrass, white clover, and lespedeza. (Capability unit VIe–1; woodland suitability group 3)

Waynesboro clay loam, 5 to 12 percent slopes, severely eroded (WcC3).—This deep, well-drained, loamy soil is on high terraces in the Highland Rim. Erosion has removed most of the original surface layer, and the plow layer, consisting mostly of material from the subsoil, is yellowish-red or reddish-brown, friable clay loam. The subsoil is red clay loam in the upper part and grades to dark-red clay at a depth of 18 to 30 inches. Limestone bedrock is at a depth of 10 to 25 feet. Some areas have a small amount of chert on the surface. Rills and a few shallow gullies mark some fields.

This soil is strongly acid and low in natural fertility. In addition, it is slightly droughty and is difficult to keep in good tilth because the plow layer has considerable clay.

This soil is suitable for occasional cultivation, but its use for row crops is limited by slope and the exposed subsoil. Yields of row crops are only moderate, but favorable yields are obtained from small grain and from grasses and legumes for hay or pasture if the soil is adequately fertilized and otherwise is well managed. (Capability unit IVe–1; woodland suitability group 3)

Waynesboro clay loam, 12 to 20 percent slopes, severely eroded (WcD3).—This soil is on moderately short slopes. It has a 4- to 6-inch surface layer of yellowish-red or reddish-brown, friable clay loam that consists mostly of subsoil material. The subsoil is red, friable clay loam in the upper foot or two and is dark-red clay in the lower part. The depth to limestone bedrock ranges from 8 to 25 feet. In places a few water-rounded pebbles are on the surface and throughout the soil. Shallow gullies have formed in some fields.

This soil is strongly acid, low in natural fertility, and moderate in available water capacity. Although roots penetrate the soil easily, tilth is poor and is difficult to maintain. Because runoff is moderately rapid, controlling erosion is a major problem.

Pasture is the main use of this soil, though a small acreage is used for corn, small grain, and hay. The soil is poorly suited to row crops but is well suited to all the common plants grown for pasture. Areas in pasture respond well to adequate fertilization and liming and to other good management. (Capability unit VIe–1; woodland suitability group 3)

Waynesboro clay loam, 20 to 30 percent slopes, severely eroded (WcE3).—Erosion has removed most of the original surface layer from this soil, and the plow layer is yellowish-red or reddish-brown, friable clay loam. This layer consists of subsoil material mixed with remnants of the original surface layer. The subsoil is red, friable clay loam that generally grades to dark-red clay at a depth of 15 to 25 inches. Shallow gullies have formed in some areas.

This soil is strongly acid, low in natural fertility, and moderate in available water capacity. It is difficult to work and to keep in good tilth. Because it is steep and severely eroded, its use is limited mainly to pasture or woodland. Most of the acreage is now in pasture, but a few areas have reverted to trees. Yields of pasture are medium if the soil is well fertilized and otherwise well managed. (Capability unit VIe–1; woodland suitability group 3)

Waynesboro gravelly sandy loam, 5 to 12 percent slopes, eroded (WsC2).—The gravelly sandy loam surface layer of this soil is yellowish brown or brown and ranges from 4 to 7 inches in thickness. The subsoil is yellowish-red or red gravelly clay loam or gravelly sandy clay that, in some places, grades to dark-red clay at a depth of 2 to 3 feet. In most places the depth to bedrock ranges from 6 to 25 feet, but a few areas are underlain by siltstone at a depth of 4 to 6 feet. The subsoil is exposed in a few severely eroded places. Included with this soil in mapping are small areas of Jefferson loam that make up about 10 percent of the total acreage.

This soil is strongly acid and low in natural fertility, but it responds fairly well to additions of lime and fertilizer. Although roots and moisture easily penetrate the thick subsoil, gravel interferes with cultivation and lowers the available water capacity, which is moderate or low.

If this soil is heavily fertilized, it produces fair yields of all crops commonly grown. Its use is limited mainly by slope and by the high content of gravel. (Capability unit IIIe–3; woodland suitability group 3)

Waynesboro gravelly clay loam, 12 to 30 percent slopes, severely eroded (WgD3).—This moderately steep or steep soil is on short slopes below ridges occupied by other Waynesboro soils. In most places the subsoil is exposed by erosion and is yellowish-red to dark-red gravelly clay loam or gravelly sandy clay to a depth of 3 to 5 feet. Most areas are underlain by yellowish-red or red cherty clay that is residuum from cherty limestone and occurs at a depth of 2 to 10 feet. In a few spots, however, the cherty clay is near the surface. The depth to limestone bedrock ranges from 5 to 25 feet.

This soil is low in fertility and in available water capacity. It is difficult to keep in good tilth because it is gravelly and has a clayey surface layer. The soil erodes easily if it is cultivated or left unprotected.

Tilled crops are poorly suited to this soil, but pasture produces adequate yields. All the common pasture plants can be grown if they are well fertilized and otherwise well managed. (Capability unit VIe–1; woodland suitability group 3)

Whitwell Series

The Whitwell series consists of moderately well drained and somewhat poorly drained soils that formed in alluvium on low stream terraces. Slopes range from 1 to 3 percent.

The main layers of a typical profile are—

0 to 8 inches, brown, friable loam.
8 to 14 inches, yellowish-brown, friable loam.
14 to 24 inches, yellowish-brown, friable clay loam that is mottled with gray.
24 to 40 inches, olive and yellow, friable clay loam that is mottled with gray.

Whitwell loam (0 to 2 percent slopes) (Ww).—This loamy soil occupies slopes of 1 to 3 percent on low terraces. It formed in alluvium and is moderately well drained or somewhat poorly drained. The surface layer is brown, friable loam about 10 inches thick, and the subsoil is yellowish-brown, friable loam that is mottled with gray and yellow below a depth of about 18 inches. Water-rounded pebbles are common below a depth of 36 inches.

This soil is medium acid or strongly acid and is low in natural fertility. After the soil dries out sufficiently, it is easily worked in spring.

Whitwell loam is well suited to soybeans, grain sorghum, red clover, white clover, lespedeza, tall fescue, and orchardgrass. Where surface drainage is good and flooding is not a problem, yields of small grain are satisfactory. Corn ordinarily produces economic yields, but wetness delays planting in some years. Yields of alfalfa, tobacco, and nursery crops are poor. (Capability unit IIw–1; woodland suitability group 1)

Use and Management of Soils

This section discusses the use and management of soils in Warren County for crops and pasture, as woodland, in engineering work, and for wildlife food and cover.

Crops and Pasture[1]

In this subsection are an explanation of capability grouping, a description of each capability unit in Warren County, and a table giving estimated yields at two levels of management.

Capability groups of soils

The capability classification is a grouping that shows, in a general way, how suitable soils are for most kinds of farming. It is a practical grouping based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment.

In this system all the kinds of soil are grouped at three levels, the capability class, subclass, and unit. The eight capability classes in the broadest grouping are designated by Roman numerals I through VIII. In class I are the soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so rough, shallow, or otherwise limited that they do not produce worthwhile yields of crops, forage, or wood products.

The subclasses indicate major kinds of limitations within the classes. Within most of the classes there can be as many as four subclasses. The subclass is indicated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* means that water in or on the soil will interfere with plant growth or cultivation (in some soils

[1] The part of this subsection dealing with management and suitability of crops was written by A. B. HARMON, agronomist, Soil Conservation Service, Columbia, Tenn.

the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony, and *c*, used in only some parts of the country, indicates that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few or no limitations. Class V can contain, at the most, only subclasses *w*, *s*, and *c*, because the soils in it are subject to little or no erosion but have other limitations that restrict their use largely to pasture, range, woodland, or wildlife.

Within the subclasses are the capability units, groups of soils enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally identified by numbers assigned locally, for example, IIe-1 or IIIe-2.

Soils are classified in capability classes, subclasses, and units in accordance with the degree and kind of their permanent limitations; but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soil; and without consideration of possible but unlikely major reclamation projects.

The eight classes in the capability system, and the subclasses and units in this county, are described in the list that follows.

Class I.—Soils that have few limitations that restrict their use. (No subclasses)
- Capability unit I-1.—Deep, nearly level, well-drained soils on first bottoms and terraces.

Class II.—Soils that have some limitations that reduce the choice of plants or require moderate conservation practices.
- Subclass IIe. Soils subject to moderate erosion if they are not protected.
  - Capability unit IIe-1.—Gently sloping, deep, well-drained soils on stream terraces and old colluvial slopes; low to moderate natural fertility.
  - Capability unit IIe-2.—Gently sloping, moderately deep and deep, well-drained soils that have a loamy surface layer and subsoil; low natural fertility.
  - Capability unit IIe-3.—Nearly level and gently sloping, moderately well drained soils that have a fragipan.
- Subclass IIw. Soils that are moderately limited by excess water.
  - Capability unit IIw-1.—Moderately well drained and somewhat poorly drained soils on first bottoms and low terraces.
- Subclass IIs. Soils that are moderately limited by chert fragments that affect moisture capacity.
  - Capability unit IIs-1.—Deep, well-drained, cherty soils on level first bottoms.

Class III.—Soils that have severe limitations that reduce the choice of plants, or require special conservation practices, or both.
- Subclass IIIe. Soils subject to severe erosion if they are cultivated and not protected.
  - Capability unit IIIe-1.—Sloping, deep, well-drained soils on terraces and old colluvial slopes; moderately low to high natural fertility.
  - Capability unit IIIe-2.—Sloping, deep, well-drained soils that have a loamy surface layer and subsoil; low natural fertility.
  - Capability unit IIIe-3.—Sloping, deep, well-drained soils that are cherty and gravelly.
  - Capability unit IIIe-4.—Sloping, moderately deep or deep, well-drained soils that have a clayey subsoil.
- Subclass IIIw. Soils that are severely limited by excess water.
  - Capability unit IIIw-1.—Poorly drained and very poorly drained soils on first bottoms and in depressions.
  - Capability unit IIIw-2.—Somewhat poorly drained, silty soils that have a fragipan.
- Subclass IIIs. Soils that are severely limited by factors affecting moisture capacity.
  - Capability unit IIIs-1.—Deep, very sandy soils on nearly level bottom lands.

Class IV.—Soils that have very severe limitations that restrict the choice of plants, require very careful management, or both.
- Subclass IVe. Soils subject to very severe erosion if they are cultivated and not protected.
  - Capability unit IVe-1.—Sloping and moderately steep soils that are deep and well drained.
  - Capability unit IVe-2.—Sloping and moderately steep, deep and moderately deep soils that have a plastic, clayey subsoil.
- Subclass IVw. Soils that are very severely limited for cultivation because of excess water.
  - Capability unit IVw-1.—Poorly drained, gray, silty soils that have a fragipan.

Class V.—Soils not likely to erode that have other limitations, impractical to remove without major reclamation, that limit their use largely to pasture or range, woodland, or wildlife food and cover. There are no Class V soils in Warren County.

Class VI.—Soils that have severe limitations that make them generally unsuitable for cultivation and that limit their use largely to pasture or range, woodland, or wildlife food and cover.
- Subclass VIe. Soils severely limited, mainly by risk of erosion, if protective cover is not maintained.
  - Capability unit VIe-1.—Moderately steep and steep soils that are deep and permeable.
  - Capability unit VIe-2.—Strongly sloping, moderately deep and deep soils that have a clayey, slowly permeable subsoil.
  - Capability unit VIe-3.—Sloping to steep, loamy soils that are shallow to sandstone rock.
- Subclass VIs. Soils generally unsuitable for cultivation and limited for other uses by their moisture capacity, stones, or other features.
  - Capability unit VIs-1.—Deep, sloping to steep, cobbly soils.

Class VII.—Soils that have very severe limitations that make them unsuitable for cultivation without major reclamation and that restrict their use largely to grazing, woodland, or wildlife food and cover.

Subclass VIIe. Soils very severely limited, mainly by risk of erosion, if protective cover is not maintained.

Capability unit VIIe-1.—Deep, very steep soils that have a cherty, clayey, slowly permeable subsoil.

Capability unit VIIe-2.—Gullied land.

Subclass VIIs. Soils very severely limited by moisture capacity, stones, or other soil features.

Capability unit VIIs-1.—Level or gently sloping, cobbly, droughty land.

Capability unit VIIs-2.—Sloping to very steep soils and land types that have 10 to 60 percent of their surface covered by rocks.

Class VIII.—Soils and landforms that have limitations that preclude their use, without major reclamation, for commercial production of plants; and that restrict their use to recreation, wildlife, water supply, or esthetic purposes. There are no class VIII soils in Warren County.

Capability units

This subsection describes each of the capability units, lists the soils in the unit, and tells of their suitability for crops, pasture, and woodland. Cropping systems and management practices are suggested. Not given are specific suggestions about amounts of fertilizer, about varieties of crops, and about seeding mixtures for pasture. Fertilizer, crop varieties, and seeding mixtures change as discoveries are made and prices change. Up-to-date recommendations are published from time to time by the Tennessee Agricultural Experiment Station and the Agricultural Extension Service. The information given in this subsection will help in selecting good uses and practices for each kind of soil. Assistance can be obtained from the Extension Service and the Soil Conservation Service in planning the management of individual farms.

CAPABILITY UNIT I-1

This capability unit consists of deep, nearly level, well-drained, productive soils. They are—

Cumberland silt loam, 0 to 2 percent slopes.
Huntington silt loam.
Sequatchie loam, 0 to 2 percent slopes.
Staser sandy loam, 0 to 2 percent slopes.
Waynesboro loam, 0 to 2 percent slopes.

Along Barren Fork, Mountain Creek, Charles Creek, Hickory Creek, and other large streams, some areas of these soils are flooded on an average of once each winter or spring. Because the streams have deep channels, however, the floods generally last only 2 or 3 days.

The soils in this unit are productive, are easy to work, and respond well to management. Their available water capacity is high.

These soils can be used intensively for most crops and pasture plants commonly grown in the county, but they are so well suited to corn, tobacco, soybeans, small grain, and alfalfa that they commonly are not used for pasture. In areas of the Huntington soil that are occasionally flooded during the growing season, producing tobacco, alfalfa, and other crops not tolerant of moderate flooding is somewhat risky. However, yields of these crops are high on the other soils. Sudangrass or millet for summer forage produces excellent supplemental pasture.

Crops respond well to fertilizer, and a high level of fertilization is justified. Row crops can be grown continuously, but green-manure crops or crop residues should be turned under to maintain tilth and the supply of organic matter.

Few management practices are needed on these soils for maintaining good tilth and controlling runoff. The soils can be tilled within a wide range of moisture content and are susceptible to only slight erosion except in a few places where overflow scours the streambanks or deposits sandy soil material. Areas that are subject to washing should be kept sodded. Runoff from adjacent uplands can be controlled by diversion ditches.

CAPABILITY UNIT IIe-1

The soils in this capability unit are deep, gently sloping, well drained, and productive. They have a plow layer of silt loam or loam. The subsoil, to a depth of 30 inches or more, ranges from silty clay loam to clay loam. The soils are—

Cumberland silt loam, 2 to 5 percent slopes.
Etowah silt loam, 2 to 5 percent slopes.
Minvale silt loam, 2 to 5 percent slopes.
Sequatchie loam, 2 to 5 percent slopes.

These soils are easily penetrated by air, water, and plant roots. They are high in available water capacity, low to moderate in natural fertility, and medium acid or strongly acid.

The soils in this unit are well suited to all crops commonly grown in the county, and they can be farmed in short cropping systems. They are easy to work and respond well to good management. If they are limed and fertilized, they produce favorable yields that are easily maintained. Heavy fertilization is justified for most crops. The soils are excellent for pasture.

Erosion can be controlled and the intake of water increased by using a crop rotation that includes grasses and legumes and close-growing crops, by cultivating on the contour, and by leaving natural waterways in sod. Also effective in reducing runoff is either terracing or stripcropping, which increases crop yields as well. Excess runoff from adjacent slopes can be safely removed through well-placed diversion ditches.

CAPABILITY UNIT IIe-2

In this capability unit are friable, well-drained soils with a root zone normally more than 3 feet thick. These soils have a plow layer of loam or silt loam and a subsoil of loam, clay loam, or silt loam. They are—

Allen loam, 2 to 5 percent slopes.
Hartsells loam, 2 to 5 percent slopes.
Jefferson loam, 2 to 5 percent slopes.
Linker loam, 2 to 5 percent slopes.
Mountview silt loam, 2 to 5 percent slopes.
Waynesboro loam, 2 to 5 percent slopes.

These soils are easy to work and to keep in good tilth, and they respond well to management. They are high or moderately high in available water capacity, are low or very low in natural fertility, and are acid throughout.

The soils in this unit are well suited to all field crops commonly grown in the county (fig. 14) and to truck crops and nursery crops. An example of a suitable rotation is a row crop, a small grain, and 1 or 2 years of grass and clover. Moderate to heavy applications of lime

Figure 14.—**Burley tobacco grown on Waynesboro loam, 2 to 5 percent slopes. Harvested tobacco is staked in the field to wilt.**

and fertilizer are needed for successfully producing alfalfa, red clover, and other pasture plants of good quality.

Erosion can be controlled and moisture conserved by using crop residues properly, by fertilizing adequately, by cultivating on the contour, and by keeping waterways in sod. Terracing and stripcropping are effective in controlling runoff on the longer slopes.

CAPABILITY UNIT IIe-3

This capability unit consists of nearly level and gently sloping, moderately well drained soils with a fragipan at a depth of about 2 feet. These soils have a light-colored, friable, silty surface layer and a yellowish, silty subsoil. They are—

Captina silt loam, 1 to 3 percent slopes.
Dickson silt loam, 1 to 4 percent slopes.
Sango silt loam.

In these soils the fragipan in the lower subsoil slows the movement of water and restricts the growth of roots. Consequently, the subsoil is waterlogged during rainy periods, particularly in winter and early in spring. In summer, however, the soils are slightly droughty during dry periods because root growth is restricted largely to the upper 2 feet of soil. The soils are easy to work, are low to moderate in natural fertility, and are strongly or very strongly acid. Crops respond well to fertilizer.

The soils in this unit produce economic yields of nearly all the common crops except alfalfa. Sorghums, soybeans, corn, tobacco, small grain, clover, lespedeza (fig. 15), tall fescue, and orchardgrass are suited. Many kinds of cropping systems are suitable, but slopes generally are too strong for row cropping every year. An example of a suitable cropping system is 2 years of row crops and 2 years of grasses and legumes.

Fertilizing is probably the most important practice of management. Unless lime and a complete fertilizer are added, yields on these soils are low. The rates of liming and fertilizing should be based on soil tests.

Controlling water is fairly easy on the soils of this unit. By cultivating on the contour and sodding the waterways, erosion can be reduced and excess runoff removed. If the soils are terraced and stripcropped, they can be safely farmed in a more intensive cropping system.

CAPABILITY UNIT IIw-1

The soils in this capability unit are moderately well drained and somewhat poorly drained. They have a 10- to 12-inch surface layer of friable silt loam or loam. Below a depth of 16 to 24 inches, they are mottled with gray and brown. The soils are—

Lindside silt loam.
Whitwell loam.

In winter and early in spring, these soils have a high water table, and their subsoil is likely to be saturated. Later in spring and in summer the water table lowers, and by summer the soils are permeable to air, water, and roots to a depth of 24 inches or more. Thus, the root zone for summer annuals is not seriously limited. These soils are medium in natural fertility and respond well to fertilization. The amount of fertilizer needed should be determined by soil tests.

Retarded internal drainage limits the use of these soils for some crops, but crops that require large amounts of moisture during the droughty periods in summer are well suited. Among the ones that produce satisfactory yields are corn, soybeans, grain sorghum, lespedeza, and plants that provide supplemental pasture in summer. Good stands of tall fescue, orchardgrass, bermudagrass, white clover, and most of the other common grasses and legumes can be grown for pasture. Small grain tends to lodge or to mature late and is subject to damage through flooding. Tobacco and alfalfa also are risky crops.

These soils are suitable for intensive use under a system of management that maintains the level of fertility and organic matter. Where row crops are grown every year (fig. 16), organic matter can be supplied and tilth maintained by turning under winter legumes in spring or by returning crop residues to the soil. Areas subject to scouring by floodwater should be kept in close-growing vegetation and used for hay or pasture.

These soils are easily tilled and can be worked within a fairly wide range of moisture content, though planting

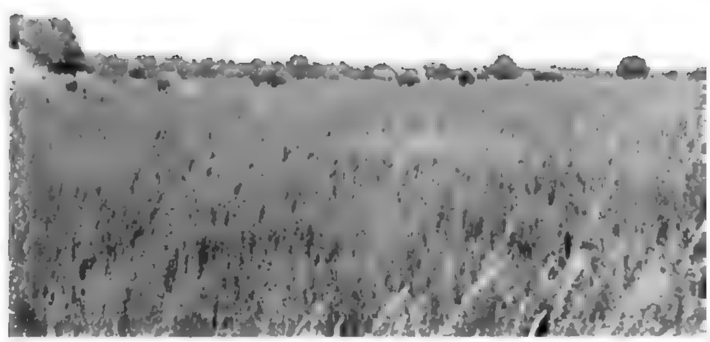

Figure 15.—**Beef cattle grazing sericea lespedeza on Dickson silt loam, 1 to 4 percent slopes.**

Figure 16.—Lindside silt loam ready for planting to corn. This soil is well suited to corn and can be used for that crop every year.

and other fieldwork are often delayed in spring because of excessive moisture. Improving surface and internal drainage widens the choice of crops and increases productivity. To help remove excess water from the surface of gentle slopes, crop rows can be alined toward drainageways. Tiling or ditching is suitable for draining many areas.

CAPABILITY UNIT IIs-1

The only soil in this capability unit—Huntington cherty silt loam—occurs on bottom land and is deep and well drained. This soil has chert or gravel on the surface and throughout the profile. The surface layer is cherty silt loam 8 to 12 inches thick. In most places the subsoil is similar to it.

On an average of once a year in winter or early in spring, this soil is subject to flooding for as long as 3 days. Chert fragments cause the available water capacity to be lower than in other soils on bottom land that are free of chert.

Most crops common in the county can be grown, but occasional overflow during the growing season limits the production of tobacco, small grain, and alfalfa. Favorable yields of corn, grain sorghum, and other row crops can be expected in the less cherty areas. Productive pasture, including crops for summer forage, can be successfully grown.

This soil is suitable for intensive cropping, but short rotations are beneficial. Properly using crop residues and green-manure crops helps to maintain fertility and to improve tilth. The response to soil amendments is good. Although chert fragments interfere with tillage, the soil can be worked within a rather wide range of moisture content.

Controlling erosion is not a serious problem, but areas subject to scouring or to fresh deposits of chert should be kept in sod. Diversion ditches are needed in some areas that receive runoff from adjacent uplands.

CAPABILITY UNIT IIIe-1

The soils in this unit are deep, well drained, and productive. They have a plow layer of friable silt loam, cherty silt loam, or loam and a subsoil of friable silty clay loam, cherty silty clay loam, or clay loam. The depth to bedrock ranges from 6 to 30 feet. In the unit are—

Cumberland silt loam, 5 to 12 percent slopes, eroded.
Etowah silt loam, 5 to 12 percent slopes.
Etowah cherty silt loam, 5 to 12 percent slopes.
Minvale silt loam, 5 to 12 percent slopes.
Sequatchie loam, 5 to 12 percent slopes, eroded.

These soils are permeable to air, water, and roots and have high available water capacity. They are easily worked, are moderately low to high in natural fertility, and are medium acid or strongly acid. Crops respond well to management.

Under good management the soils in this unit are well suited to alfalfa and other common crops, to plants grown as nursery stock, and to plants used for hay and pasture. They produce satisfactory yields of corn, tobacco, small grain, grasses, and legumes. Because these sloping soils are susceptible to erosion, however, the cropping system should include close-growing crops in a long rotation. An example of a suitable rotation is 1 year of a row crop, 1 year of small grain or a winter cover crop, and 2 years of a grass-legume mixture grown for hay or pasture. Growing alfalfa or another deep-rooted crop in the rotation for more than 2 years is beneficial.

Tillage should be on the contour. Runoff can be controlled by leaving natural waterways in sod and, in many places, by terracing. On steeper slopes where terraces are not suited, stripcropping can be used effectively (fig. 17).

CAPABILITY UNIT IIIe-2

This capability unit consists of deep, well-drained soils that have a friable, loamy surface layer and subsoil. The soils are—

Allen loam, 5 to 12 percent slopes.
Hartsells loam, 5 to 12 percent slopes.
Jefferson loam, 5 to 12 percent slopes.
Linker loam, 5 to 12 percent slopes.
Mountview silt loam, 5 to 12 percent slopes.
Waynesboro loam, 5 to 12 percent slopes.
Waynesboro loam, 5 to 12 percent slopes, eroded.

Figure 17.—Contour stripcropping on Cumberland silt loam, 5 to 12 percent slopes, eroded. Stripcropping helps to control runoff on this erodible soil.

Figure 18.—**Erosion damage in a field of Waynesboro loam, 5 to 12 percent slopes, eroded, that was left bare.**

These soils are easy to work and can be cultivated within a fairly wide range of moisture content. They are low to very low in natural fertility and are acid throughout. Crops respond well to fertilizer.

If the soils are well fertilized, yields of all the common crops are favorable. Especially well suited are small grain, hay, and pasture. Alfalfa grows well in most areas and produces favorable yields. Pasture of good quality can be produced if legumes are included in the mixture. These soils are moderately easy to conserve, but they need long rotations, heavy fertilization, and measures that control erosion. Figure 18 shows erosion damage on an unprotected area of a soil in this unit.

A 4- or 5-year crop rotation is suitable on these soils. An example of a suitable rotation is 1 year of a row crop, 1 year of a small grain, and 3 years of alfalfa or of grass and clover. A cover crop should follow a tilled crop.

All tillage should be on the contour. Properly constructed terraces are needed if row crops are grown more often than 1 year in 4 or 5. Stripcropping is desirable on slopes where terraces are not practical. Waterways should remain in sod.

CAPABILITY UNIT IIIe-3

The only soil in this capability unit—Waynesboro gravelly sandy loam, 5 to 12 percent slopes, eroded—has a subsoil of gravelly clay loam. On the surface and throughout the profile are moderate to large amounts of small, rounded pebbles that make up 15 to 40 percent of the soil.

This soil is low in natural fertility and is strongly acid. Although it is friable and permeable, it contains so much gravel that the available water capacity is moderate or low and cultivation is somewhat difficult.

Gravel limits the use of this soil for most crops, except those that require little tillage or that grow and mature late in fall and in spring. Corn and other late-maturing row crops generally yield poorly because they lack moisture late in the growing season. Sorghum, lespedeza, and other drought-resistant crops grow well, as do mixtures of orchardgrass and white clover or of fescue and white clover grown for hay and pasture.

If this soil is used for tilled crops, a suitable cropping sequence includes close-growing crops or sod crops for at least 3 years. In some areas a rotation of small grain and a grass-legume mixture for hay or pasture is more suitable. Areas that contain large deposits of gravel are better suited to pasture than to other uses. Adequate amounts of fertilizer and lime are needed for even moderate yields of all crops.

Erosion can be controlled by cultivating on the contour, stripcropping the strong slopes, and establishing sod in the waterways. The less sloping areas can be terraced if suitable outlets can be built and maintained.

CAPABILITY UNIT IIIe-4

In this capability unit are moderately deep or deep soils that are well drained. Their surface layer is friable, but their subsoil is high in clay content and, in places, is cherty. The soils are—

Baxter cherty silt loam, 5 to 12 percent slopes.
Christian silt loam, 2 to 5 percent slopes, eroded.

These soils are low in natural fertility and are strongly acid, but they respond fairly well to fertilizer. The available water capacity is moderate to low. Except in eroded spots where the plow layer is clayey, the soils are fairly easy to work. Their root zone is only about 15 to 18 inches thick and is fairly shallow for most annual crops but is considerably more favorable for perennials.

Because of the clay and chert in the subsoil, these soils are best suited to small grain, hay, or pasture. Yields of corn and tobacco are often reduced during droughty periods late in summer and early in fall. Small grain, grain sorghum, sericea lespedeza, annual lespedeza, and alfalfa yield well if they are properly managed and are adequately fertilized and limed. Row crops produce acceptable yields if they are followed by 3 or 4 years of sod crops, such as orchardgrass and white clover or tall fescue and white clover.

Good tilth is difficult to maintain where erosion has exposed the clayey subsoil. It can be maintained or improved, however, by growing deep-rooted legumes or green-manure crops or by properly using crop residues. Cultivating on the contour and keeping natural waterways in sod help to protect the soils. In addition, stripcropping may be needed in cultivated areas to prevent erosion on some of the longer slopes.

CAPABILITY UNIT IIIw-1

In this unit are nearly level, poorly drained and very poorly drained soils on first bottoms and in depressions. The soils are—

Dunning silty clay loam.
Elkins silt loam.
Melvin silt loam.

The Melvin and Dunning soils are neutral to medium acid, and the Elkins soil is strongly acid.

In all these soils wetness is caused by a high water table, seepage from adjacent slopes, and flooding. As a result, seeding is delayed from a few days to a few weeks in spring. During summer the water table drops and the previously waterlogged soils are permeable to roots, but the roots grow too slowly to take full advantage of this

drying and are limited mostly to the upper 20 inches of soil.

Stream overflow and excess moisture limit the use of these soils and often delay seedbed preparation and tillage. Yields of silage crops, sorghums, soybeans, and lespedeza are fair, but they vary widely and depend on the date of planting and the density of the stand. Fescue, white clover, and other perennial plants tolerant of wetness produce good hay and pasture, if grazing generally is limited to summer and fall.

Improved drainage broadens the use of these soils and increases yields of crops. If the soils are drained, they respond well enough to lime and fertilizer to justify heavy applications. For artificial drainage to be feasible, there must be a suitable outlet for disposing of excess water. Thus, the cost of installing a drainage system and the need for additional cultivated acreage should be considered. The carrying capacity of pasture can be increased by properly fertilizing and by seeding suitable grasses and legumes.

CAPABILITY UNIT IIIw-2

Lawrence silt loam—the only soil in this capability unit—is nearly level and somewhat poorly drained. This silty soil is friable and permeable in the upper part, but it has a fragipan in the lower subsoil that slows water movement. During rainy periods in summer and for long periods in winter and early in spring, the root zone is saturated by water that is held, or perched, above the fragipan. In some places water stands on the surface during rainy periods in winter.

For most farming and engineering purposes, the use of this soil is limited by the seasonally fluctuating water table. The soil is very low in natural fertility and, because of the fragipan, has a shallow root zone that is droughty in summer unless rainfall is well distributed.

Because of excessive moisture and the shallow root zone, this soil produces only fair yields of crops. It is suited to grain sorghum, soybeans, lespedeza, and fescue but is poorly suited to alfalfa, tobacco, and other crops that do not tolerate wetness. Excess water often delays planting in spring and decreases plant growth in winter and early in spring. Small grain grows fairly well except in depressions that are ponded during winter. Well suited for hay and pasture are grass and clover mixtures, such as fescue and white clover.

If drainage is improved, this soil can be used for row crops or grain crops every year, but drainage is not feasible in many areas, because outlets are lacking. Furthermore, because the subsoil is slowly permeable, tile drains often fail to remove excess water. Ditches are probably more effective than tile.

CAPABILITY UNIT IIIs-1

Bruno loamy sand—the only soil in this capability unit—is droughty and very sandy. It occurs on nearly level first bottoms and normally is more than 30 inches deep. This soil is strongly acid and is very low in natural fertility. Water moves through it rapidly, and the available water capacity is very low.

Drought-resistant grasses and deep-rooted legumes are best suited to this soil. Yields of melons and early maturing vegetables may be acceptable if the soil is well fertilized. Under irrigation, other common crops can be grown, but their value usually does not justify the expense. Fairly well suited are bermudagrass, sericea lespedeza, and other plants that are tolerant of drought in summer and of periodic flooding during their dormant period.

Conserving this soil is difficult because it is likely, at times, to be overwashed and scoured by floodwater. Most areas should be kept in sod that is well fertilized.

CAPABILITY UNIT IVe-1

The soils in this unit are deep and well drained. Except where severely eroded, they have a friable, loamy surface layer. Their subsoil is thick, friable or firm, and readily permeable to roots. The soils are—

Allen loam, 12 to 20 percent slopes.
Cumberland silty clay loam, 5 to 12 percent slopes, severely eroded.
Etowah silt loam, 12 to 20 percent slopes.
Etowah cherty silt loam, 12 to 20 percent slopes.
Jefferson loam, 12 to 20 percent slopes.
Mountview silt loam, 5 to 12 percent slopes, severely eroded.
Waynesboro clay loam, 5 to 12 percent slopes, severely eroded.
Waynesboro loam, 12 to 20 percent slopes, eroded.

These soils are medium acid or strongly acid, have a fairly high available water capacity, and respond well to management. The cherty Etowah soil is more difficult to till than the other soils.

Favorable yields can be obtained from small grain, alfalfa, sericea lespedeza, or permanent pasture. Many kinds of row crops can be grown if they are included in a long rotation with cover crops and a mixture of close-growing plants for hay or pasture. Alfalfa and other deep-rooted legumes are well suited but should be seeded with grass for controlling erosion and increasing yields. If adequately fertilized, the soils produce pasture of high quality. Slope is the main limitation.

Cropping systems should be 5 or 6 years long if a row crop is grown. An example of a suitable sequence is 1 year of a row crop, 1 year of a small grain or a cover crop, and 3 or 4 years of a grass-legume mixture for hay or pasture. If a row crop is not included, a shorter rotation of small grain and a hay or pasture mixture is suitable. Returning crop residues helps to increase soil moisture, to improve tilth, and to maintain organic matter. This practice is especially beneficial in severely eroded areas.

Special practices generally needed to control runoff and erosion on these soils are farming on the contour and keeping natural waterways in sod. Stripcropping also is suitable and gives high returns on these strong slopes. It may be desirable to reseed pasture in alternate strips.

CAPABILITY UNIT IVe-2

This capability unit consists of sloping and moderately steep soils that have a silty surface layer and a plastic, clayey subsoil. The soils are—

Baxter cherty silty clay loam, 5 to 12 percent slopes, severely eroded.
Baxter cherty silt loam, 12 to 20 percent slopes.
Christian silt loam, 5 to 12 percent slopes.
Christian silt loam, 5 to 12 percent slopes, eroded.
Swaim silt loam, 3 to 10 percent slopes, eroded.
Talbott silt loam, 5 to 12 percent slopes.

The Baxter soils have chert on the surface and throughout the profile. In areas not severely eroded, their surface

layer is friable and fairly easy to work. Where erosion has exposed the subsoil, however, the plow layer is sticky when wet and hard when dry and is somewhat difficult to cultivate.

Unless the soils in this unit are limed and fertilized, they are acid and low in fertility. Even if their fertility is improved, they produce only low to medium yields of corn and other late-maturing row crops because their available water capacity generally is low.

Maintaining productivity in these soils is difficult because of slope and the content of chert and clay. For this reason, the soils are better suited to small grain or to hay and pasture than they are to row crops. Alfalfa, sericea lespedeza, and other deep-rooted legumes produce economic yields under good management. In a suitable cropping system, row crops or grain crops are limited to 1 year out of about 5 or 6. A shorter rotation is desirable in the less eroded areas if it is supplemented by conservation practices and by the use of close-growing crops.

Soil losses can be kept to a minimum if farming operations follow the contour of the slope and if waterways are kept in sod. Stripcropping on the longer slopes is effective when tilled crops are grown.

CAPABILITY UNIT IVw-1

Guthrie silt loam is the only soil in this unit. It is a nearly level, gray soil that is wet because of seepage and runoff from adjacent areas. The lower subsoil is a fragipan that is compact and slowly permeable.

This soil is strongly acid. It is low in natural fertility but responds moderately well to fertilizer. Yields vary from one year to another, for the moisture supply is erratic. Because water ponds or remains above the compact layer and waterlogs the root zone during winter and in spring, the soil normally is too wet for early cultivation.

Poor drainage limits the use of this soil to crops that can tolerate wetness. Fair yields are obtained from annual hay crops or from perennial pasture plants, such as lespedeza or a mixture of fescue and white clover. If surface drainage is improved, sorghum and soybeans can be grown. Yields of corn, tobacco, small grain, and alfalfa are poor.

Managing this soil consists mainly of selecting the proper plants, applying adequate fertilizer, and improving drainage where feasible. Because there is no erosion hazard, the soil can be used intensively for crops that are suited to it. Pasture can be safely grazed only in drier periods in spring, summer, and fall and should not be used during wet periods, for grazing compacts the surface layer and seriously weakens or destroys the stand.

Draining this soil is not feasible in many areas, because suitable outlets are lacking. In areas that can be drained, however, surface ditches and diversion ditches effectively remove excess water and thus help to increase yields. Because the subsoil is slowly permeable, tile drains generally are not effective.

CAPABILITY UNIT VIe-1

In this unit are deep, well-drained soils on moderately steep and steep hillsides. Except where they are severely eroded, these soils have a loamy and friable surface layer. Their subsoil is mainly clay loam or silty clay loam that is thick, friable, and readily permeable to roots. The soils are—

- Allen clay loam, 12 to 20 percent slopes, severely eroded.
- Allen loam, 20 to 30 percent slopes.
- Cumberland silty clay loam, 12 to 20 percent slopes, severely eroded.
- Etowah cherty silt loam, 20 to 30 percent slopes.
- Jefferson loam, 12 to 20 percent slopes, severely eroded.
- Staser sandy loam, 10 to 25 percent slopes.
- Waynesboro loam, 20 to 30 percent slopes.
- Waynesboro clay loam, 12 to 20 percent slopes, severely eroded.
- Waynesboro clay loam, 20 to 30 percent slopes, severely eroded.
- Waynesboro gravelly clay loam, 12 to 30 percent slopes, severely eroded.

These soils have a root zone 3 feet or more thick. The available water capacity is moderately high in most areas but is low in those that are cherty and gravelly. The soils are medium acid or strongly acid and range from low to moderate in natural fertility. Crops respond well to fertilizer.

Because these soils are strongly sloping, cherty and gravelly, or severely eroded, they are not suited to tilled crops and should be kept in permanent vegetation. Most cleared areas are best used for pasture, though the less sloping ones are suitable for hay and produce fair yields under good management. Best suited are mixtures of deep-rooted legumes and grasses, such as alfalfa and orchardgrass or sericea lespedeza and fescue, but a mixture of fescue and white clover or lespedeza also can be established and maintained. Lime and fertilizer are needed in amounts indicated by soil tests.

These soils should be worked only when seeding a forage mixture or renovating a stand, and they should be tilled only on the contour. To control excess erosion, long and steep slopes are best seeded in contour strips over a 2-year period. Grazing should be carefully controlled, especially when the stand is young, and should be rotated in order to maintain good sod. Severely eroded areas not suitable for pasture should be planted to desirable trees.

CAPABILITY UNIT VIe-2

This capability unit consists of strongly sloping, moderately deep and deep, well-drained soils on uplands. These soils have a plastic, clayey subsoil that is slowly permeable. The soils are—

- Baxter cherty silt loam, 20 to 30 percent slopes.
- Baxter cherty silty clay loam, 12 to 20 percent slopes, severely eroded.
- Baxter cherty silty clay loam, 20 to 30 percent slopes, severely eroded.
- Christian silty clay loam, 5 to 12 percent slopes, severely eroded.
- Christian silt loam, 12 to 20 percent slopes.
- Christian silt loam, 12 to 20 percent slopes, eroded.
- Christian silty clay loam, 12 to 20 percent slopes, severely eroded.

In uneroded areas the surface layer of these soils is silty and friable. In areas where erosion has exposed the subsoil, however, cultivation is difficult because the plow layer is sticky when wet and hard when dry. The Baxter soils have chert on the surface and throughout the profile.

The soils of this unit are acid and are low in natural fertility. Generally, they do not produce satisfactory yields, for their available water capacity is not high enough.

These soils are poorly suited to tilled crops and are best used for pasture. They are suited to most pasture plants

grown in the county. Common lespedeza, sericea lespedeza, bermudagrass, and white clover produce well. Heavy applications of lime and a complete fertilizer are needed to establish and maintain stands of grasses and legumes.

These soils should be worked only when a seedbed is prepared or a stand is reestablished. Long slopes are best seeded in alternate strips across the slope. In some places diversion ditches are needed to divert runoff. Steeper, severely eroded areas not needed for pasture should be planted to desirable trees. Pine is best suited, but yellow-poplar or walnut is suited to some areas.

CAPABILITY UNIT VIe-3

In this capability unit are sloping to steep, shallow soils on the Cumberland Plateau. These soils are friable and loamy throughout the surface layer and subsoil. In most places sandstone bedrock occurs at a depth of 12 to 24 inches, but in a few areas it crops out. The soils are—

Ramsey loam, 5 to 12 percent slopes.
Ramsey loam, 12 to 20 percent slopes.
Ramsey loam, 20 to 30 percent slopes.

The soils in this unit are very strongly acid and are low in natural fertility. They have a shallow root zone and are low in available water capacity.

These loamy soils are best suited to pasture or timber. If the less sloping areas are cleared and heavily fertilized, they produce fair yields of fescue, white clover, and lespedeza for hay or pasture. The steeper areas that are in trees should be managed only for timber.

Pastured areas should be worked only to reseed or to renovate the stand. For better protection on the steep slopes, pasture should be established in alternate strips on the contour. Cleared areas not needed for pasture should be planted to trees.

CAPABILITY UNIT VIs-1

The soils in this capability unit are deep and permeable, but they have many cobbles on the surface and throughout the profile. Their surface layer is cobbly loam or cobbly sandy loam, and their subsoil is cobbly clay loam. The cobbles are mostly sandstone and are 3 to 10 inches or more across. The soils are—

Allen cobbly loam, 5 to 20 percent slopes.
Allen cobbly loam, 20 to 30 percent slopes.
Jefferson cobbly sandy loam, 5 to 20 percent slopes.

These cobbly soils are droughty and have low or medium available water capacity. They are acid and low in natural fertility.

These soils generally are too steep, cobbly, and droughty for tilled crops, but they are fairly well suited to fescue, white clover, sericea lespedeza, annual lespedeza, and bermudagrass for pasture. Hay crops are suitable in the less sloping areas where the cobbles do not seriously interfere with mowing and other work. Adequate amounts of lime and fertilizer are required for economic production of hay and pasture.

Soil losses can be controlled by maintaining a permanent cover, by working or disking only to prepare a seedbed, and by seeding the long, steep slopes in alternate strips on the contour. Open areas not required for pasture should be planted to suitable trees.

CAPABILITY UNIT VIIe-1

Baxter cherty silt loam, 30 to 50 percent slopes—the only soil in this unit—is deep, very steep, and cherty. It has a slowly permeable subsoil of cherty clay loam or clay. The hazard of erosion is severe.

This soil is best suited to use as woodland or for wildlife, and most of it is wooded. It is poorly suited to pasture.

CAPABILITY UNIT VIIe-2

Only Gullied land is in this capability unit. The management needed on this land depends on the amount of soil material left between the gullies. For this reason, an examination is needed in each area. Some areas can be leveled and seeded to low-growing vegetation, and others are best suited to trees. In some areas runoff from higher slopes should be diverted to protect the land from further erosion.

CAPABILITY UNIT VIIs-1

Only Cobbly alluvial land is in this capability unit. It consists of deep, excessively drained soil material on bottom land along streams in mountain coves. It contains many rounded sandstone pebbles and stones that range from 4 inches to as much as 18 inches across and cover 30 to 60 percent of the surface.

About 40 percent of this land type is in forest, and the rest is idle or in unimproved pasture. Because most areas are stony and droughty, they probably are best suited to trees. Some of the less stony areas are suited to pasture or nursery stock.

CAPABILITY UNIT VIIs-2

Exposed bedrock, many stones, a thin solum, or steep slopes severely limit use of the soils and land types in this unit. The soils and land types are—

Bodine cherty silt loam, 20 to 45 percent slopes.
Ramsey very rocky sandy loam, 10 to 20 percent slopes.
Ramsey-Jefferson stony complex, 20 to 45 percent slopes.
Rock land.
Stony colluvial land.
Talbott very rocky complex, 5 to 20 percent slopes, eroded.
Talbott very rocky complex, 20 to 30 percent slopes, eroded.

These mapping units are droughty, respond poorly to management, and produce very low yields. They are most suitable as woodland or for wildlife but are not suitable for field crops or improved pasture. In the less steep areas where the soil is sufficiently deep, a limited amount of grazing is available.

Estimated yields

Table 2 lists estimated yields of principal crops grown on each soil in the county under two levels of management. Yields in columns A are those expected under the management commonly practiced in the county. Those in columns B are expected under the improved management defined later in this subsection. Under the prevailing management, yields generally are 20 to 35 percent less than they are under improved management. Estimates are not listed if the soil ordinarily is not planted to a crop or is not suited to it.

The estimates in columns B are based on (1) yields obtained in long-term experiments, (2) yields harvested on farms that are cooperating in a study of soil produc-

tivity and management, and (3) estimates by agronomists and soil scientists who have had experience with the crops and soils in Warren County.

The yield data obtained from the long-term experiments were adjusted to reflect the combined effects of slope, weather, and level of management. For those soils on which long-term experiments were not conducted, estimates were made from experiments on similar soils. The estimates are an average of long-term annual yields obtained from nonirrigated soils. The overflow hazard of soils on bottom lands was disregarded because the effects of flooding vary locally.

In estimating the yields in columns B, the practices listed in the following paragraphs were assumed. The farmer can obtain yields similar to those listed in columns B if he—

1. Fertilizes each crop according to needs indicated by soil tests and by past cropping and fertilizing

TABLE 2.—*Estimated average acre yields of principal crops under two levels of management*

[Yields in columns A are those to be expected under common management; those in columns B, under a high level of management. The estimates are an average of long-term yields to be obtained from nonirrigated soils. Absence of yield figure indicates that crop is not suited to the soil or is not commonly grown on it]

	Corn		Burley tobacco		Alfalfa		Wheat		Oats		Lespedeza seeded alone		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Lb.*	*Lb.*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Allen loam, 2 to 5 percent slopes	45	75	1,650	2,200	2.3	3.4	23	43	40	68	1.1	1.6	110	170
Allen loam, 5 to 12 percent slopes	42	67	1,600	2,150	2.2	3.3	23	40	35	67	1.0	1.5	105	160
Allen loam, 12 to 20 percent slopes	35	54	1,500	1,850	2.0	3.0	19	34	30	57	.8	1.2	90	130
Allen loam, 20 to 30 percent slopes	--	--	--	--	--	--	--	--	--	--	--	--	75	115
Allen clay loam, 12 to 20 percent slopes, severely eroded	23	35	--	--	1.4	2.3	16	27	23	40	.5	.7	55	85
Allen cobbly loam, 5 to 20 percent slopes	25	36	1,200	1,500	1.4	2.1	14	24	25	43	.5	.9	65	110
Allen cobbly loam, 20 to 30 percent slopes	--	--	--	--	--	--	--	--	--	--	--	--	45	95
Baxter cherty silt loam, 5 to 12 percent slopes	36	52	1,350	1,700	1.6	2.4	23	32	37	57	.6	1.1	75	135
Baxter cherty silt loam, 12 to 20 percent slopes	32	45	1,275	1,600	1.5	2.3	22	30	35	53	.5	1.0	70	125
Baxter cherty silt loam, 20 to 30 percent slopes	--	--	--	--	--	--	--	--	--	--	--	--	60	105
Baxter cherty silt loam, 30 to 50 percent slopes	--	--	--	--	--	--	--	--	--	--	--	--	52	85
Baxter cherty silty clay loam, 5 to 12 percent slopes, severely eroded	24	36	1,100	1,450	1.2	1.6	13	21	27	40	.4	.7	53	90
Baxter cherty silty clay loam, 12 to 20 percent slopes, severely eroded	21	32	--	--	1.1	1.5	12	18	25	36	.3	.6	45	80
Baxter cherty silty clay loam, 20 to 30 percent slopes, severely eroded	--	--	--	--	--	--	--	--	--	--	--	--	40	70
Bodine cherty silt loam, 20 to 45 percent slopes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bruno loamy sand	20	25	--	--	--	--	10	14	20	28	.3	.4	30	45
Captina silt loam, 1 to 3 percent slopes	44	68	1,450	1,900	1.4	2.0	23	35	40	65	.8	1.5	90	155
Christian silt loam, 2 to 5 percent slopes, eroded	34	50	1,250	1,700	2.1	2.9	24	34	38	60	.7	1.2	80	140
Christian silt loam, 5 to 12 percent slopes	33	47	1,200	1,650	2.1	2.8	23	33	35	57	.7	1.1	77	135
Christian silt loam, 5 to 12 percent slopes, eroded	32	44	1,175	1,600	2.0	2.7	22	32	33	55	.6	1.0	75	130
Christian silt loam, 12 to 20 percent slopes	30	42	1,150	1,600	1.9	2.5	21	30	30	53	.6	.9	72	125
Christian silt loam, 12 to 20 percent slopes, eroded	27	38	1,125	1,550	1.7	2.3	20	29	28	48	.5	.8	70	115
Christian silty clay loam, 5 to 12 percent slopes, severely eroded	20	28	1,100	1,400	1.4	1.9	15	24	25	40	.3	.7	55	90
Christian silty clay loam, 12 to 20 percent slopes, severely eroded	--	--	--	--	1.2	1.6	13	20	22	34	.2	.5	47	75
Cobbly alluvial land	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cumberland silt loam, 0 to 2 percent slopes	55	80	1,800	2,100	2.9	3.5	27	43	45	70	1.2	1.7	125	190
Cumberland silt loam, 2 to 5 percent slopes	50	75	1,650	1,950	2.9	3.5	27	43	45	70	1.1	1.6	115	180
Cumberland silt loam, 5 to 12 percent slopes, eroded	44	65	1,525	1,775	2.8	3.4	25	40	43	67	.9	1.4	105	165
Cumberland silty clay loam, 5 to 12 percent slopes, severely eroded	30	43	1,100	1,500	2.1	2.8	19	35	29	50	.6	1.0	85	130
Cumberland silty clay loam, 12 to 20 percent slopes, severely eroded	25	38	--	--	1.7	2.5	14	27	26	40	.5	.8	65	110
Dickson silt loam, 1 to 4 percent slopes	40	65	1,550	1,900	1.4	2.0	22	35	38	60	.7	1.4	90	140
Dunning silty clay loam	30	[2] 50	--	--	--	--	--	--	--	--	.7	1.3	100	145
Elkins silt loam	--	[2] 45	--	--	--	--	--	--	--	--	.6	[2] 1.3	75	[2] 145
Etowah cherty silt loam, 5 to 12 percent slopes	42	62	1,500	1,950	2.3	3.0	24	38	40	60	.8	1.4	100	155
Etowah cherty silt loam, 12 to 20 percent slopes	39	54	1,400	1,750	2.1	2.7	21	35	38	55	.7	1.3	105	140
Etowah cherty silt loam, 20 to 30 percent slopes	--	--	--	--	--	--	--	--	--	--	--	--	85	115
Etowah silt loam, 2 to 5 percent slopes	55	85	1,850	2,300	2.5	3.4	26	43	45	70	1.3	1.8	125	185
Etowah silt loam, 5 to 12 percent slopes	50	78	1,750	2,200	2.5	3.2	25	41	43	67	1.2	1.7	115	170
Etowah silt loam, 12 to 20 percent slopes	42	63	1,525	1,850	2.2	2.8	22	37	40	60	.9	1.5	110	160

See footnotes at end of table.

TABLE 2.—*Estimated average acre yields of principal crops under two levels of management*—Continued

	Corn		Burley tobacco		Alfalfa		Wheat		Oats		Lespedeza seeded alone		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Lb.*	*Lb.*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Gullied land														
Guthrie silt loam		[2] 42									.6	[2] 1.2	70	[2] 120
Hartsells loam, 2 to 5 percent slopes	45	80	1,450	2,200	1.6	2.8	18	40	35	65	.8	1.5	75	155
Hartsells loam, 5 to 12 percent slopes	40	72	1,375	2,100	1.5	2.6	17	37	33	62	.7	1.3	70	140
Huntington cherty silt loam	55	80	1,600	2,000	1.8	2.6	23	35	40	62	1.3	1.7	120	190
Huntington silt loam	65	110	1,850	2,300	2.2	2.9	24	37	45	68	1.4	2.0	125	210
Jefferson cobbly sandy loam, 5 to 20 percent slopes	25	38	1,100	1,550	1.4	1.9	14	20	26	45	.4	.8	65	105
Jefferson loam, 2 to 5 percent slopes	45	75	1,650	2,250	1.8	2.7	22	42	38	68	.8	1.5	85	160
Jefferson loam, 5 to 12 percent slopes	40	68	1,500	2,000	1.7	2.6	21	40	36	65	.7	1.3	80	150
Jefferson loam, 12 to 20 percent slopes	35	58	1,400	1,800	1.6	2.3	18	36	34	60	.6	1.1	70	135
Jefferson loam, 12 to 20 percent slopes, severely eroded	28	46	1,250	1,650	1.4	1.8	14	30	28	52	.4	.9	65	110
Lawrence silt loam	30	46					12	[2] 20	26	[2] 40	.6	1.2	75	135
Lindside silt loam	50	80	1,150	[2] 1,700			18	25	40	58	1.4	2.0	125	200
Linker loam, 2 to 5 percent slopes	42	80	1,600	2,200	2.1	3.0	20	40	35	65	.7	1.5	85	155
Linker loam, 5 to 12 percent slopes	40	68	1,500	2,100	2.0	2.9	20	38	35	62	.7	1.4	85	145
Melvin silt loam	27	[2] 55									.8	[2] 1.7	90	135
Minvale silt loam, 2 to 5 percent slopes	45	75	1,700	2,300	2.4	3.2	23	42	38	70	1.0	1.7	115	170
Minvale silt loam, 5 to 12 percent slopes	40	66	1,600	2,150	2.4	3.1	23	40	36	66	.8	1.5	105	160
Mountview silt loam, 2 to 5 percent slopes	40	70	1,700	2,300	1.8	2.7	22	42	37	68	.8	1.5	85	160
Mountview silt loam, 5 to 12 percent slopes	37	63	1,600	2,150	1.8	2.6	20	40	35	64	.7	1.4	80	150
Mountview silt loam, 5 to 12 percent slopes, severely eroded	27	45	1,100	1,600	1.4	2.1	17	35	28	55	.5	1.1	60	120
Ramsey loam, 5 to 12 percent slopes	18	27					9	17	18	32	.5	.8	25	65
Ramsey loam, 12 to 20 percent slopes							9	15	16	30	.4	.7	25	65
Ramsey loam, 20 to 30 percent slopes														
Ramsey very rocky sandy loam, 10 to 20 percent slopes														
Ramsey-Jefferson stony complex, 20 to 45 percent slopes														
Rock land														
Sango silt loam	35	56	1,250	1,600	1.2	1.7	14	24	28	46	.7	1.2	75	140
Sequatchie loam, 0 to 2 percent slopes	60	95	1,800	2,300	2.3	2.9	25	43	48	70	1.4	1.9	120	190
Sequatchie loam, 2 to 5 percent slopes	55	85	1,800	2,200	2.3	2.9	25	43	48	70	1.3	1.8	115	180
Sequatchie loam, 5 to 12 percent slopes, eroded	50	78	1,650	2,100	2.1	2.7	23	38	43	62	1.1	1.6	100	160
Staser sandy loam, 0 to 2 percent slopes	55	85	1,600	2,100	1.7	2.5	23	35	40	62	1.3	1.8	120	190
Staser sandy loam, 10 to 25 percent slopes													95	135
Stony colluvial land														
Swaim silt loam, 3 to 10 percent slopes, eroded	25	37	1,100	1,400	1.6	2.5	17	26	25	45	.5	.8	60	100
Talbott silt loam, 5 to 12 percent slopes	23	35	1,100	1,400	1.6	2.4	16	24	25	45	.5	.8	60	95
Talbott very rocky complex, 5 to 20 percent slopes, eroded													40	55
Talbott very rocky complex, 20 to 30 percent slopes, eroded														
Waynesboro loam, 0 to 2 percent slopes	50	80	1,700	2,300	2.4	3.5	23	43	40	70	1.2	1.7	120	180
Waynesboro loam, 2 to 5 percent slopes	47	75	1,650	2,200	2.4	3.5	23	43	40	70	1.1	1.6	110	170
Waynesboro loam, 5 to 12 percent slopes	43	67	1,650	2,150	2.3	3.4	23	40	36	67	1.0	1.5	105	160
Waynesboro loam, 5 to 12 percent slopes, eroded	40	63	1,600	2,100	2.3	3.3	22	38	33	64	.9	1.4	100	150
Waynesboro loam, 12 to 20 percent slopes, eroded	36	54	1,500	1,850	2.1	3.0	19	34	30	58	.8	1.2	90	130
Waynesboro loam, 20 to 30 percent slopes													75	115
Waynesboro clay loam, 5 to 12 percent slopes, severely eroded	27	44	1,100	1,500	1.7	2.5	17	29	25	48	.6	1.0	70	110
Waynesboro clay loam, 12 to 20 percent slopes, severely eroded	22	34			1.6	2.3	16	27	23	40	.5	.7	55	85
Waynesboro clay loam, 20 to 30 percent slopes, severely eroded													45	70
Waynesboro gravelly sandy loam, 5 to 12 percent slopes, eroded	25	38	1,100	1,500	1.5	2.3	14	20	28	48	.5	.8	70	110
Waynesboro gravelly clay loam, 12 to 30 percent slopes, severely eroded													55	8
Whitwell loam	48	78	1,100	1,500			15	[2] 24	30	[2] 50	1.2	1.8	115	175

[1] Number of days in the grazing season that 1 acre will provide grazing for one cow, steer, or horse; five hogs; or seven sheep or goats without injury to the pasture. To get tons of air-dry forage per acre, divide the number of cow-acre-days by 53.

[2] Yields are for areas from which excess surface water is removed by ditches or drains.

practices. This refers especially to needs for phosphorus, potassium, calcium, and minor elements.
2. Selects high-yielding varieties of crops suited to the soil.
3. Prepares seedbeds adequately.
4. Plants or seeds by using suitable methods and at an appropriate rate and at the right time.
5. Inoculates legumes.
6. Uses shallow cultivation for row crops.
7. Controls weeds, insects, and diseases.
8. Uses cropping systems that conserve soil, such as those suggested in the subsection "Capability Units" or similar systems.
9. Where needed, conserves soils and water by establishing waterways, cultivating on the contour, terracing, or contour stripcropping.
10. Protects pasture from overgrazing.

By fertilizing and planting at about the rates suggested in the following paragraphs, a farmer can expect to obtain the yields in column B of table 2.

Corn: Soils that produce 85 bushels or more of corn per acre, as indicated in column B of table 2, require 100 to 125 pounds of nitrogen and 12,000 to 16,000 plants per acre. Soils that produce yields of 60 to 85 bushels ordinarily require 75 to 100 pounds of nitrogen and 8,000 to 12,000 plants. Soils that yield 40 to 60 bushels ordinarily require 50 to 70 pounds of nitrogen and about 8,000 plants. If the estimated yield is less than 40 bushels of corn per acre, the soil is poorly suited to corn and may be better suited to some other crop.

Nitrogen can be supplied by using commercial fertilizer, barnyard manure, residue from legumes, or any combination of these. The rates of fertilization and planting of corn grown for silage are the same as those of corn grown for grain. To determine the approximate yield of corn silage, in tons, divide the number of bushels of corn by 5.

Burley tobacco: To obtain the yields of burley tobacco listed in column B, apply 100 to 130 pounds of nitrogen at, or shortly before, planting time, and use 8,500 to 10,000 plants per acre. The nitrogen can be supplied by adding commercial fertilizer or by combining a commercial fertilizer and barnyard manure.

Alfalfa: Apply 20 pounds of borax per acre when alfalfa is seeded and add 20 pounds annually thereafter. After the first year apply annually the amounts of phosphate and potash indicated by soil tests, or if the soils are not tested, apply 30 pounds per acre of phosphate and at least 120 pounds of potash. Control grazing, and do not cut hay between September 10 and the date of the first killing frost. The estimated yields listed for alfalfa in table 2 do not apply to soils that are ponded or flooded.

Small grain: To obtain the yields of wheat and oats listed in column B, apply 30 pounds of nitrogen per acre at seeding time in fall. For both common and improved management, the approximate yield, in tons, of oats harvested for hay can be determined by dividing the number of bushels of oats listed in the appropriate column by 31.

Lespedeza: To obtain the yields of lespedeza listed in column B, seed Kobe lespedeza alone in spring on a prepared seedbed or allow it to volunteer, and fertilize in amounts determined by soil tests. If lespedeza is overseeded on a small grain harvested for grain, it yields annually about 50 to 60 percent less than if it were seeded alone. On the average, overseeding results in nearly complete failure of the lespedeza crop once every 2 years. If the small grain is harvested for hay, the estimated yields of lespedeza generally are about 80 percent of those obtained when lespedeza is seeded alone.

Pasture: To obtain the yields of pasture listed in column B of table 2, apply fertilizer at seeding time in amounts determined by soil tests, and if the clover in a mixture is sparse, topdress late in February each year with 30 pounds of nitrogen per acre.

Pasture plants suited to the soils of Warren County are too numerous to list in the table. On the poorly drained Elkins, Guthrie, Melvin, and Dunning soils, yields are estimated for tall fescue and white clover, both of which are water tolerant. The estimates shown for the rest of the soils in the county are those of the common pasture plants. Common mixtures for improved pasture are orchardgrass and white clover or tall fescue and white clover. For information about suitability of specified soils for specified pasture plants, see the section "Descriptions of the Soils" and the subsection "Capability Units."

Woodland [2]

This subsection describes the woodland of Warren County, explains woodland suitability grouping, describes the groups and lists the soils in them, and discusses factors affecting woodland management.

Slightly more than 40 percent of the acreage in Warren County is woodland, all of which is privately owned. The principal commercial trees are yellow-poplar, white oak, red oak, white ash, hickory, redcedar, shortleaf pine, Virginia pine, and black walnut. Many other species are used in varying amounts by the wood-using industries in the county or are shipped to other markets. In 1960, eight wood-using industries in McMinnville employed over 600 persons and grossed $9,000,000. This did not take into account the men, sawmills, and equipment used in harvesting timber or manufacturing rough lumber at portable sawmills. At the present time there is no market for pulpwood in the county.

That part of the county on the Cumberland Plateau is heavily forested, but the woodland in the Highland Rim section consists mainly of small woodlots on farms.

Woodland suitability groups

The soils of Warren County have been placed in 13 woodland suitability groups according to those characteristics that affect growth of trees and management of the stands. Each group consists of soils that have about the same suitability for wood crops, require about the same management, and have about the same potential productivity.

Listed in table 3, and described in the text, are the 13 woodland suitability groups in this county. For each woodland group, table 3 gives a rating for the degree of hazards or limitations that affect management. The table also lists the trees that should be favored in planting and in managing existing stands, the average site index rating for important trees in each group, and the average yearly growth of those trees. Some of the terms used in the table

[2] By C. M. Henninger, woodland conservationist, Soil Conservation Service.

and in the narrative part of this subsection require explanation.

Competition from other plants refers to the rate of invasion by unwanted trees, shrubs, and vines when openings are made in the canopy. Competition is *slight* if it does not prevent adequate natural regeneration and early growth, or interfere with the normal development of planted seedlings. Competition is *moderate* if it delays the establishment and slows the growth of seedlings, either naturally occurring or planted, but does not prevent the eventual development of a fully stocked, normal stand. Competition is *severe* if it prevents adequate restocking, either natural or artificial, without intensive preparation of the site and without special maintenance practices, including weeding.

Limitations to the use of equipment refers to soil characteristics and topographic features that restrict or prohibit the use of conventional equipment for planting and harvesting wood crops, constructing roads, controlling unwanted vegetation, and controlling fires. The limitation is *slight* if there is little or no restriction on the type of equipment that can be used or the time of the year that equipment can be used. The limitation is *moderate* if the use of equipment is restricted by one or more unfavorable characteristics, such as slope, stones or other obstructions, seasonal wetness, instability, or risk of injury to roots of trees. The limitation is *severe* if special equipment is needed and the use of such equipment is severely restricted by one or more unfavorable soil characteristics.

Seedling mortality refers to the expected loss of seedlings as a result of unfavorable soil characteristics or topographic features, not as a result of plant competition. Even if healthy seedlings of suitable species are correctly planted or occur naturally in adequate numbers, some will not survive if conditions are unfavorable. Ratings are based on the mortality of seedlings among the number normally planted for adequate stocking. Mortality is *slight* if the loss of seedlings is less than 25 percent. It is *moderate* if the loss of seedlings is between 25 and 50 percent. Mortality is *severe* if the loss is more than 50 percent.

The hazard of erosion refers to the degree of potential soil loss where timber is cut and removed from the land. The rating is *slight* if problems of erosion control are unimportant. A rating of *moderate* indicates that some attention must be given to prevent unnecessary erosion. A rating of *severe* indicates that intensive treatments, specialized equipment, and special methods of operation must be planned to minimize soil deterioration.

The potential productivity of a soil for a specified kind of tree may be expressed as a *site index*. The site index is the average height, in feet, that the best (dominant and codominant) trees of a given species, growing on a specified soil, will attain in 50 years. Table 3 gives the average site indexes for the principal kinds of trees on the soil of each woodland group. These average site indexes are based on measurements of trees. The table also gives the average annual growth in board feet, according to the International Log Rule.

WOODLAND SUITABILITY GROUP 1

This group consists of well-drained to somewhat poorly drained soils on bottom lands and low terraces. These soils have a deep, permeable root zone and high or very high available water capacity. In most places their surface layer and subsoil are silt loam or loam. The soils are—

Huntington silt loam.
Huntington cherty silt loam.
Lindside silt loam.
Sequatchie loam, 0 to 2 percent slopes.
Sequatchie loam, 2 to 5 percent slopes.
Sequatchie loam, 5 to 12 percent slopes, eroded.
Staser sandy loam, 0 to 2 percent slopes.
Staser sandy loam, 10 to 25 percent slopes.
Whitwell loam.

These soils generally are used for cultivated crops and pasture. They are excellent sites for all timber trees, especially yellow-poplar, black walnut, and upland oaks.

Because the supply of available moisture is ample and the inherent fertility is relatively high, plant competition is severe where an opening is made in the canopy or where an open area is planted. Site preparation and repeated weedings are necessary to obtain a stand of desirable trees that are free to grow.

WOODLAND SUITABILITY GROUP 2

This group consists of well-drained soils that are medium textured in the surface layer and the subsoil. These soils have a deep, permeable root zone and a high available moisture capacity. They are mainly on low terraces and foot slopes. The soils are—

Etowah silt loam, 2 to 5 percent slopes.
Etowah silt loam, 5 to 12 percent slopes.
Etowah silt loam, 12 to 20 percent slopes.
Etowah cherty silt loam, 5 to 12 percent slopes.
Etowah cherty silt loam, 12 to 20 percent slopes.
Etowah cherty silt loam, 20 to 30 percent slopes.
Minvale silt loam, 2 to 5 percent slopes.
Minvale silt loam, 5 to 12 percent slopes.

These soils have been used extensively for crops, but some of the steeper slopes have reverted to timber. The soils are good sites for all timber trees, especially yellow-poplar, black walnut, upland oaks, and native pines.

Because the moisture supply is good, plant competition is severe. Site preparation and weeding are needed to obtain a satisfactory stand of desirable trees.

On slopes greater than 20 percent, limitations to the use of equipment are moderate. The hazard of erosion is moderate on the steepest slopes.

WOODLAND SUITABILITY GROUP 3

In this group are well-drained uplands soils that have a medium-textured surface layer and a clay loam to clay subsoil. The root zone in these soils is deep and permeable, and the available water capacity is moderately low to high. The soils are—

Allen clay loam, 12 to 20 percent slopes, severely eroded.
Allen loam, 2 to 5 percent slopes.
Allen loam, 5 to 12 percent slopes.
Allen loam, 12 to 20 percent slopes.
Allen loam, 20 to 30 percent slopes.
Allen cobbly loam, 5 to 20 percent slopes.
Allen cobbly loam, 20 to 30 percent slopes.
Cumberland silt loam, 0 to 2 percent slopes.
Cumberland silt loam, 2 to 5 percent slopes.
Cumberland silt loam, 5 to 12 percent slopes, eroded.
Cumberland silty clay loam, 5 to 12 percent slopes, severely eroded.
Cumberland silty clay loam, 12 to 20 percent slopes, severely eroded.

TABLE 3.—*Woodland suitability groups, their estimated productivity, and*

Woodland group and map symbols	Competition from other plants	Limitations to use of equipment [1]	Seedling mortality	Hazard of erosion
Group 1 Hr, Hu, Ln, SeA, SeB, SeC2, StA, StD, Ww.	Severe	Slight	Slight	Slight
Group 2 EtC, EtD, EtE, EwB, EwC, EwD, MnB, MnC.	Severe	Slight or moderate	Slight	Slight or moderate
Group 3 AaD3, AcD, AcE, AnB, AnC, AnD, AnE, CsA, CsB, CsC2, CuC3, CuD3, WaA, WaB, WaC, WaC2, WaD2, WaE, WcC3, WcD3, WcE3, WgD3, WsC2.	Moderate	Slight or moderate	Slight	Moderate or severe
Group 4 HaB, HaC, JeB, JeC, JeD, JeD3, JsD, LrB, LrC, MoB, MoC, MoC3.	Moderate	Slight	Slight	Slight or moderate
Group 5 BaC, BaD, BaE, BaF, BcC3, BcD3, BcE3, BoE.	Moderate	Moderate or severe	Slight	Moderate
Group 6 ChB2, ChC, ChC2, ChD, ChD2, CnC3, CnD3, SwC2, TaC.	Slight or moderate	Slight or moderate	Slight or moderate	Moderate
Group 7 CaB, DkB, Sa.	Moderate	Moderate	Slight	Slight
Group 8 Du.	Moderate	Severe	Slight	Slight
Group 9 RaC, RaD, RaE, RcD, RfE.	Slight	Moderate or severe	Slight	Slight
Group 10 Br.	Moderate	Severe	Severe	Slight
Group 11 Ek, Gu, La, Me.	Moderate	Severe	Slight	Slight
Group 12 Co, Su.	Slight	Severe	Slight	Moderate
Group 13 Gd, Ro, TrC2, TrE2.	Slight	Severe	Severe	Severe

[1] Generally based on use of a 2- or 3-ton truck having a single axle.
[2] Plus and minus values (±) are standard deviations calculated where four or more plot measurements were available. A number in parentheses following the site index indicates the number of measured plots on which the site index was measured.

Waynesboro loam, 0 to 2 percent slopes.
Waynesboro loam, 2 to 5 percent slopes.
Waynesboro loam, 5 to 12 percent slopes.
Waynesboro loam, 5 to 12 percent slopes, eroded.
Waynesboro loam, 12 to 20 percent slopes, eroded.
Waynesboro loam, 20 to 30 percent slopes.
Waynesboro gravelly sandy loam, 5 to 12 percent slopes, eroded.
Waynesboro clay loam, 5 to 12 percent slopes, severely eroded.
Waynesboro clay loam, 12 to 20 percent slopes, severely eroded.
Waynesboro clay loam, 20 to 30 percent slopes, severely eroded.
Waynesboro gravelly clay loam, 12 to 30 percent slopes, severely eroded.

These soils have been extensively used for crops. Some areas of the steeper and the eroded soils have been planted to trees or have reverted to forest by natural seeding. The soils in this group are good sites for most timber trees. The severely eroded soils are best suited to pines.

Because plant competition is moderate, mulching is beneficial on the most severely eroded soils, and weeding generally is needed in natural stands.

The use of equipment is moderately limited, especially on steep or eroded slopes during periods of prolonged rainfall.

ratings for major limitations and hazards affecting management

Species to favor in existing stands	Species suitable for planting	Potential productivity		
		Trees	Average site index [2]	Average yearly growth [3]
				Bd. ft. per acre
Yellow-poplar, upland oaks, black walnut, and white ash.	Yellow-poplar, black walnut, and loblolly pine.	Yellow-poplar	100$\pm$9(11)	550
		Upland oaks	90(3)	400
		Virginia pine	74$\pm$7(8)	530
Yellow-poplar, upland oaks, black walnut, white ash, and shortleaf pine.	Yellow-poplar, black walnut, and loblolly pine.	Yellow-poplar	91$\pm$11(11)	450
		Upland oaks	73(1)	220
		Shortleaf pine	74(2)	650
		Virginia pine	78(2)	570
Yellow-poplar, upland oaks, black walnut, shortleaf pine, and Virginia pine.	Loblolly pine, shortleaf pine, and black walnut.	Yellow-poplar	91$\pm$10(10)	450
		Upland oaks	75$\pm$13(4)	240
		Shortleaf pine	70$\pm$9(9)	600
		Virginia pine	76$\pm$6(14)	550
Yellow-poplar, upland oaks, shortleaf pine, and Virginia pine.	Loblolly pine and shortleaf pine	Yellow-poplar	87$\pm$10(22)	410
		Upland oaks	67$\pm$12(42)	170
		Shortleaf pine	63$\pm$7(59)	510
		Virginia pine	71$\pm$9(43)	500
Yellow-poplar, upland oaks, shortleaf pine, and Virginia pine.	Loblolly pine and shortleaf pine	Yellow-poplar	91$\pm$8(26)	450
		Upland oaks	69$\pm$9(20)	190
		Shortleaf pine	62$\pm$11(6)	500
		Virginia pine	64(3)	440
Yellow-poplar, upland oaks, shortleaf pine, Virginia pine, and redcedar.	Loblolly pine and shortleaf pine	Yellow-poplar	85$\pm$5(7)	380
		Upland oaks	69$\pm$3(6)	190
		Shortleaf pine	71$\pm$10(6)	610
		Virginia pine	76$\pm$6(12)	550
Yellow-poplar, upland oaks, and shortleaf pine.	Loblolly pine	Yellow-poplar	95$\pm$10(17)	490
		Upland oaks	78$\pm$12(12)	270
		Shortleaf pine	69$\pm$4(7)	590
		Virginia pine	79$\pm$9(6)	580
Lowland oaks, white oak, and sweetgum	Loblolly pine	([4])	([4])	([4])
Upland oaks, shortleaf pine, and Virginia pine.	Shortleaf pine, Virginia pine, loblolly pine, and white pine.	Upland oaks	68(2)	140
		Shortleaf pine	63$\pm$11(15)	520
		Virginia pine	64$\pm$9(6)	440
Sycamore, black willow, river birch, and elm.	Planting generally not feasible	([4])	([4])	([4])
Lowland oaks, white oak, yellow-poplar, sweetgum, and red maple.	Loblolly pine	Yellow-poplar	88$\pm$7(13)	420
		Upland oaks	77$\pm$8(12)	260
Yellow-poplar, northern red oak, white oak, shortleaf pine, and Virginia pine.	Planting generally not required	Yellow-poplar	84(1)	380
		Upland oaks	65(1)	160
Upland oaks, redcedar, shortleaf pine, and Virginia pine.	Pines on gullied land; planting generally not feasible on other mapping units.	([4])	([4])	([4])

[3] International Log Rule. Average yearly growth per acre of trees in managed, well-stocked stands to age 60 years.
[4] Reliable data not available.

The erosion hazard is moderate or severe and depends on the steepness of slope and the degree of erosion.

WOODLAND SUITABILITY GROUP 4

This group consists of uplands well-drained soils that are medium textured in the surface layer and subsoil. They have a moderately deep or deep, permeable root zone and a high available water capacity. The soils are—

Hartsells loam, 2 to 5 percent slopes.
Hartsells loam, 5 to 12 percent slopes.
Jefferson loam, 2 to 5 percent slopes.
Jefferson loam, 5 to 12 percent slopes.
Jefferson loam, 12 to 20 percent slopes.
Jefferson loam, 12 to 20 percent slopes, severely eroded.
Jefferson cobbly sandy loam, 5 to 20 percent slopes.
Linker loam, 2 to 5 percent slopes.
Linker loam, 5 to 12 percent slopes.
Mountview silt loam, 2 to 5 percent slopes.
Mountview silt loam, 5 to 12 percent slopes.
Mountview silt loam, 5 to 12 percent slopes, severely eroded.

The Hartsells and Linker soils are on the Cumberland Plateau and have been little used for crops. The other soils have been extensively cropped and pastured. All the soils in this group are good sites for most timber trees

(fig. 19). The severely eroded ones are best suited to pines.

Competition from undesirable plants is moderate, and weeding is needed in most natural stands. On the Hartsells and Linker soils, where the hardwoods are commonly of low quality, the stands can be converted to pines by using a chemical spray on the hardwoods. In stands consisting of pines mixed with low-quality hardwoods, the pines generally are favored in weeding operations.

Erosion is a slight or moderate hazard, depending on the steepness of slope and the degree of past erosion.

WOODLAND SUITABILITY GROUP 5

In this group are well-drained to excessively drained, cherty soils on hilly and steep uplands. These soils have a moderately deep or deep, permeable root zone. Their available water capacity is moderate to low. The soils are—

- Baxter cherty silt loam, 5 to 12 percent slopes.
- Baxter cherty silt loam, 12 to 20 percent slopes.
- Baxter cherty silt loam, 20 to 30 percent slopes.
- Baxter cherty silt loam, 30 to 50 percent slopes.
- Baxter cherty silty clay loam, 5 to 12 percent slopes, severely eroded.
- Baxter cherty silty clay loam, 12 to 20 percent slopes, severely eroded.
- Baxter cherty silty clay loam, 20 to 30 percent slopes, severely eroded.
- Bodine cherty silt loam, 20 to 45 percent slopes.

Except where they are steepest, these soils have been cleared for crops and pasture in many places. Areas covered by original forest are in stands of oaks, hickory, and yellow-poplar. Areas retired from farming have reverted to pines, yellow-poplar, and pines mixed with hardwoods. Some areas have been planted to shortleaf or loblolly pine (fig. 20). The soils in this group are fair to good for desirable trees. Their capacity to produce timber depends on the depth to bedrock and, especially on the steeper slopes, the availability of seep water.

Plant competition is moderate, and weeding is generally needed in natural stands.

The use of equipment is moderately or severely limited by the steepness and length of slopes and, in places, by rock outcrops.

Figure 19.—**A plantation of white pine on Hartsells and Linker soils.**

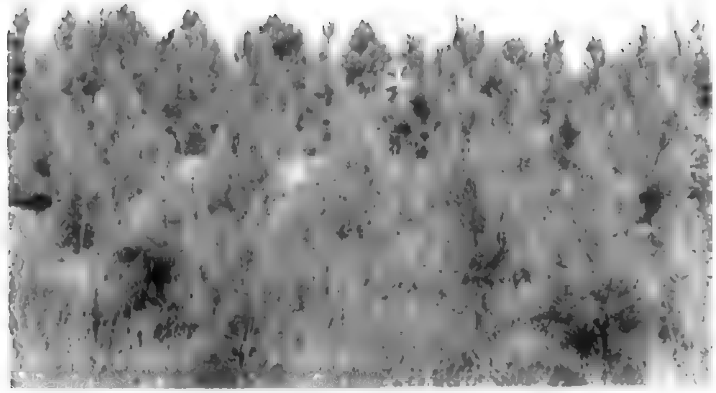

Figure 20.—**Loblolly pines planted on an area of Baxter cherty silty clay loam, 20 to 30 percent slopes, severely eroded.**

Erosion is a moderate hazard. Because the soils are rapidly permeable, gullies generally do not form in wooded areas, even on the steepest slopes.

WOODLAND SUITABILITY GROUP 6

This group consists of well-drained soils that have a thin, medium-textured surface layer and a plastic, clayey subsoil. These soils are mainly on rolling and hilly uplands. Their root zone ranges from 2 to 3 feet in depth and is slowly permeable. The available water capacity is moderately low. The soils are—

- Christian silt loam, 2 to 5 percent slopes, eroded.
- Christian silt loam, 5 to 12 percent slopes.
- Christian silt loam, 5 to 12 percent slopes, eroded.
- Christian silt loam, 12 to 20 percent slopes.
- Christian silt loam, 12 to 20 percent slopes, eroded.
- Christian silty clay loam, 5 to 12 percent slopes, severely eroded.
- Christian silty clay loam, 12 to 20 percent slopes, severely eroded.
- Swaim silt loam, 3 to 10 percent slopes, eroded.
- Talbott silt loam, 5 to 12 percent slopes.

Many areas of these soils have been cleared and are used for crops and pasture. Areas still wooded are covered mainly by oaks, hickory, and yellow-poplar. Volunteer stands on eroded soils consist mostly of Virginia pine, redcedar, and mixtures of these trees and hardwoods. Some loblolly pine has been planted in old fields. Eastern redcedar is especially suited to the Swaim soil. The soils in this group are medium in their capacity to produce timber, but in some of the severely eroded areas, the site index is 5 to 10 points lower than in other areas.

Competition from other plants is slight on the eroded soils and is moderate on the others. Weeding in natural stands is needed to favor more desirable trees.

The use of logging trucks is moderately limited on the eroded soils, which are slippery when wet.

Pines and redcedar grow well on the eroded soils, but seedlings of most hardwoods are subject to moderate mortality.

Erosion is a moderate hazard, especially in areas that are rolling or eroded.

WOODLAND SUITABILITY GROUP 7

In this group are moderately well drained soils that have a fragipan, or compacted layer, 20 to 30 inches below

the surface. These soils are medium textured and permeable above the fragipan, but they are slowly permeable and poorly aerated below a depth of about 2 feet. Their available water capacity is moderate. The soils are—

Captina silt loam, 1 to 3 percent slopes.
Dickson silt loam, 1 to 4 percent slopes.
Sango silt loam.

Most areas of these soils have been cleared and are used for crops and pasture. Existing stands consist of oaks, hickory, yellow-poplar, and other hardwoods. Loblolly pine grows well where planted. A few shortleaf and Virginia pines are scattered through the stands in old fields.

Competition from unwanted plants is moderate. Weeding favors the desirable trees in natural stands.

A high water table moderately limits the use of equipment in winter.

WOODLAND SUITABILITY GROUP 8

Dunning silty clay loam -the only soil in this group—is a black, poorly drained soil on bottom land. It is clayey, slowly permeable, and often ponded in winter and spring.

Most of this soil has been cleared, drained, and used for pasture and crops. The trees in natural stands are willow oak, water oak, pin oak, white oak, sweetgum, red maple, and a few yellow-poplars.

Because the soil is wet, plant competition is moderate. Eliminating vines, grasses, and herbaceous plants is a moderate problem in young stands and in old fields that have been abandoned. Planted loblolly pine does moderately well.

The use of equipment is severely limited by a high water table in winter and spring.

WOODLAND SUITABILITY GROUP 9

Well-drained to excessively drained, medium- and coarse-textured soils are in this group. They are shallow to bedrock and have a low available water capacity. They are mostly on hilly and steep uplands of the Cumberland Plateau. The soils are -

Ramsey loam, 5 to 12 percent slopes.
Ramsey loam, 12 to 20 percent slopes.
Ramsey loam, 20 to 30 percent slopes.
Ramsey very rocky sandy loam, 10 to 20 percent slopes.
Ramsey-Jefferson stony complex, 20 to 45 percent slopes.

Most areas of these soils are covered by trees, principally oaks, hickory, Virginia pine, and shortleaf pine. The soils are medium to poor sites for most tree species.

A small amount of weeding may be needed to eliminate culls and other undesirable trees.

Limitations to the use of equipment are moderate on the mild slopes and are severe on the steep or rocky slopes.

WOODLAND SUITABILITY GROUP 10

The only soil in this group is Bruno loamy sand. It is on bottom lands and is very sandy and excessively drained.

Much of this soil has been cleared and is used for crops and pasture in fields with other soils. Existing stands consist of sycamore, red birch, black willow, alder, elm, ash, and other hardwoods in various mixtures.

Competition from other plants is moderate on this soil. In natural stands, weeding can be used to favor the desirable trees.

The deep sand and the high water table impose severe limitations on the use of trucks.

Because the soil is droughty, seedling mortality is severe.

WOODLAND SUITABILITY GROUP 11

This group is made up of poorly drained and somewhat poorly drained soils on bottom lands and uplands. These soils are medium textured, poorly aerated, and often ponded in winter and spring. They are—

Elkins silt loam.
Guthrie silt loam.
Lawrence silt loam.
Melvin silt loam.

Some areas of these soils have been cleared and used for pasture and crops, but most areas are in stands of white oak, red oak, yellow-poplar, water oaks, red maple, and sweetgum.

Plant competition is moderate, and weeding is needed to eliminate undesirable trees, bushes, and vines.

The use of equipment is severely limited by the high water table in winter and spring.

WOODLAND SUITABILITY GROUP 12

In this group are land types that are very stony or very cobbly. They occur in narrow coves and on long, steep slopes in the Cumberland Mountains. They are—

Cobbly alluvial land.
Stony colluvial land.

These land types are suited to many kinds of trees, and nearly all the acreage is covered with mixed stands of upland hardwoods. Because the areas receive seepage water and have a thick, permeable root zone, they can furnish a moderate amount of moisture to trees.

Limitations to the use of equipment are severe because of steep slopes, stones, and large rocks. These limitations must be considered in planning the use of equipment and the construction of access roads and trails. During logging the erosion hazard is moderate, particularly on roads and trails and in disturbed areas.

The land types in this group should be managed so that the desirable trees are favored in existing stands. These trees are listed in table 3. Planting is seldom needed.

WOODLAND SUITABILITY GROUP 13

This group consists of soils and land types that are extremely variable in texture, composition, and slope. They vary within the same area and from one area to another. They are—

Gullied land.
Rock land.
Talbott very rocky complex, 5 to 20 percent slopes, eroded.
Talbott very rocky complex, 20 to 30 percent slopes, eroded.

The kinds of trees growing on these soils also are variable. The depth of soil, the amount of rock, the location on the slope, the amount of seep water, the severity of erosion, and the origin of the soil material—all of these affect the growth of trees and management of the stands. The hazards and limitations to use may vary more widely within a single area than they do from one area to the next. The capacity of these soils to produce timber ranges from very low to medium.

Engineering [3]

This subsection was written so that the soil survey information contained in this report can be used for engineering purposes.

With the use of the soil map for identification, the engineering interpretations in this subsection can be useful for many purposes. It should be emphasized that they may not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and where the excavations are deeper than the depths of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected. The information can be used to—

1. Make soil and land use studies that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Make preliminary estimates of the engineering properties of soils for use in planning agricultural drainage systems, farm ponds, and irrigation systems.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting locations for highways and airports and in planning detailed investigations of the selected locations.
4. Locate probable sources of gravel and other construction materials.
5. Correlate performance of engineering structure with soil mapping units, and thus develop information that will be useful in designing and maintaining the structures.
6. Determine the suitability of soil units for cross-

[3] By David Royster, soils engineer, Materials and Test Division, Tennessee State Highway Department, and George T. Jackson, soil scientist, Soil Conservation Service.

Table 4.—*Engineering test data* [1] *for soil*

Soil name and location	Parent material	Tennessee report No.	Depth	Horizon	Moisture-density [2]: Maximum dry density	Moisture-density [2]: Optimum moisture
			Inches		*Lb. per cu. ft.*	*Percent*
Cumberland silt loam:						
1.9 miles E. of U.S. Highway No. 70S and 0.12 mile SE. of State Route 30, 100 feet E. of a farm road. (Ortho)	Alluvium from limestone, shale, and sandstone.	15	0–6	Ap	110	12
		16	6–18	B21	102	18
		17	18–38	B22	98	22
		18	38–72	B23	98	22
2.1 miles N. of Shady Rest and 0.1 mile S. of the Collins River. (Sandy variant)	Alluvium from limestone, shale, and sandstone.	1	0–8	Ap	110	12
		2	14–22	B21	108	14
		3	22–58	B22	105	16
		4	58–72	B3	104	18
0.8 mile SE. of Shiloh Church and 0.3 mile E. of Mud Creek, in a road cut. (Shallow)	Alluvium from limestone, shale, and sandstone.	5	0–6	Ap	107	13
		6	6–41	B2	100	20
		7	58–72	C	106	18
Etowah cherty silt loam:						
0.6 mile S. of Pleasant Cove Church and 150 feet W. of gravel road. (Ortho)	Old alluvium from cherty limestone.	19	0–8	Ap	108	14
		20	12–29	B21	108	15
		21	29–42	B22	110	14
		22	42–66	B3	109	15
0.35 mile NW. of fire tower on Cope Mountain. (Deep variation)	Old alluvium from cherty limestone.	8	0–6	Ap	96	17
		9	14–28	B21	109	14
		10	28-60	B22	108	15
		11	60–72	IIC	106	16
2.6 miles SW. of Irving College on Highway No. 4398 and 200 yards W. of private road. (Shallow)	Old alluvium from cherty limestone.	12	0–7	Ap	104	14
		13	15–26	B22	102	18
		14	42–60	IIC2	96	22

[1] Tests performed by the Tennessee Department of Highways in accordance with standard procedures of the American Association of State Highway Officials (AASHO) (*1*).

[2] Moisture-density according to AASHO Designation T 99–57, Method A. In this method a 5.5-pound rammer and a 12-inch drop are used.

[3] Mechanical analyses according to the AASHO Designation T 88. Results by this procedure may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the

country movement of vehicles and construction equipment.

7. Supplement information obtained from other published maps and reports and from aerial photographs for the purpose of making maps and reports that can be used readily by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

Some of the terms used by the soil scientist may be unfamiliar to the engineer and some words—for example, *soil*, *clay*, *silt*, *sand*, *aggregate*, and *granular*—may have special meaning in soil science. These terms are defined in the Glossary at the end of the report.

To make the best use of the soil survey, the engineer should know the physical properties of the soil materials and the condition of the soil in place. After testing the soil materials and observing the behavior of each soil in engineering structures and foundations, the engineer can develop design recommendations suited to each soil on the map.

Soil test data

Samples from the principal soil types in two extensive soil series in the county were tested according to standard procedures so that the soils could be evaluated for engineering purposes. The test data are given in table 4. In addition, test data for soils of several series that are similar to the ones in Warren County are given in the published soil surveys for Putnam and Coffee Counties, Tenn. (*8, 10*).[4] These surveys can be obtained through the office of the Soil Conservation Service or the Extension Service in those counties.

In the moisture-density (compaction) test, soil material is compacted into a mold several times with a constant

[4] Italic numbers in parentheses refer to Literature Cited, p. 78.

samples taken from six soil profiles

Mechanical analysis [3]											Liquid limit	Plasticity index	Classification	
Fragments larger than 3 inches discarded in field sampling (estimated)	Percentage passing sieve [4]—						Percentage smaller than [4]—						AASHO [5]	Unified [6]
	3-in.	¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
------	------	------	------	100	97	77	75	61	30	24	30	9	A-4(8)	ML-CL
------	------	------	------	100	98	85	85	77	50	44	42	11	A 7 5(9)	ML.
------	------	------	------	100	98	84	82	75	54	50	44	8	A-5(10)	ML.
------	------	------	------	100	98	83	80	73	57	53	45	9	A-5(10)	ML.
------	------	------	------	100	97	62	59	47	20	13	22	3	A-4(5)	ML.
------	------	------	------	100	98	69	68	58	34	28	31	13	A-6(8)	CL.
------	------	------	------	100	99	68	67	60	41	36	35	17	A-6(9)	CL.
------	------	------	------	100	99	68	67	62	46	42	40	20	A-6(11)	CL.
------	------	------	------	100	96	56	49	40	23	19	27	4	A-4(4)	ML-CL.
------	------	------	------	100	99	77	76	71	59	54	46	8	A-5(9)	ML.
------	------	------	100	99	93	57	55	50	42	40	41	9	A5(4)	ML.
15	100	95	92	90	84	60	55	42	19	14	28	4	A-4(5)	ML-CL.
20	------	100	94	88	80	62	61	50	31	25	36	4	A-4(5)	ML.
40	------	------	100	97	90	69	65	59	40	34	38	8	A-4(7)	ML.
50	100	99	95	92	85	66	62	56	37	34	39	9	A-4(6)	ML.
10	100	98	90	89	82	72	69	55	26	16	38	8	A-4(7)	ML.
7	100	78	64	62	58	53	52	44	21	15	35	9	A-4(3)	ML-CL.
7	100	85	81	80	75	68	64	55	28	20	33	9	A-4(6)	ML-CL.
------	------	100	98	97	94	84	81	71	40	32	38	11	A-6(8)	ML.
8	100	97	92	92	88	70	67	52	30	21	30	8	A-4(7)	ML-CL.
5	100	94	88	87	83	69	67	62	39	32	39	10	A-4(7)	ML.
------	100	98	93	92	88	81	81	76	58	53	40	6	A-4(8)	ML.

material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soil.

[4] Based on material passing a 3-inch sieve. Laboratory test data not corrected for amount discarded greater than 3 inches.

[5] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Pt. 1, Ed. 8): The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHO Designation M 145-49.

[6] The Soil Conservation Service and Bureau of Public Roads have agreed to consider that all soils having plasticity indexes within 2 points of the A-line are to be given a borderline classification.

compactive effort, each time at a successively higher moisture content. The density (unit weight) of the soil material increases as the moisture content increases until the optimum moisture content is reached. After that, the density decreases as the moisture content increases. The highest density obtained in the compaction test is termed "maximum density." Data on moisture and density are important in earthwork because, as a rule, the soil will be most stable if it is compacted to the maximum density when it is at the optimum moisture content.

The results of the mechanical analyses show the relative proportions of the particles of different sizes. The liquid limit and the plasticity index indicate the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the material passes from a semisolid to a plastic. The liquid limit is the moisture content at which the material passes from a plastic to a liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is in a plastic condition.

Table 4 gives two engineering classifications for each soil sample. These classifications are based on the liquid limit, the plasticity index, and the data obtained by me-

TABLE 5.—*Brief description of soils and their*

[Dashes indicate information is not available

Map symbol	Soil	Description of soil and site	Depth from surface	Classification
				USDA texture
			Inches	
AnB AnC AnD AnE	Allen loam, 2 to 5 percent slopes. Allen loam, 5 to 12 percent slopes. Allen loam, 12 to 20 percent slopes. Allen loam, 20 to 30 percent slopes.	Well-drained soils formed in local alluvium on foot slopes and benches; limestone bedrock at depth of 5 to 25 feet.	0–10 10–40 40–60	Loam Clay loam Clay loam or clay
AaD3	Allen clay loam, 12 to 20 percent slopes, severely eroded.	Well-drained soils formed in local alluvium on foot slopes and benches; upper 4 to 6 inches of soil washed away; limestone rock at depth of 5 to 25 feet.	0–40 40–60	Clay loam Clay loam or clay
AcD AcE	Allen cobbly loam, 5 to 20 percent slopes. Allen cobbly loam, 20 to 30 percent slopes.	Well-drained soils formed in local alluvium on foot slopes and benches; cobbles 3 to 10 inches across on surface and in profile; limestone bedrock at depth of 5 to 25 feet.	0–14 14–60	Cobbly loam Cobbly clay loam
BaC BaD BaE BaF	Baxter cherty silt loam, 5 to 12 percent slopes. Baxter cherty silt loam, 12 to 20 percent slopes. Baxter cherty silt loam, 20 to 30 percent slopes. Baxter cherty silt loam, 30 to 50 percent slopes.	Well-drained cherty soils on rolling to steep uplands; formed from cherty limestone; depth to limestone rock is 5 to 30 feet.	0–8 8–20 20–72	Cherty silt loam Cherty silty clay loam. Cherty clay
BcC3 BcD3 BcE3	Baxter cherty silty clay loam, 5 to 12 percent slopes, severely eroded. Baxter cherty silty clay loam, 12 to 20 percent slopes, severely eroded. Baxter cherty silty clay loam, 20 to 30 percent slopes, severely eroded.	Well-drained cherty soils on rolling to hilly uplands; formed from cherty limestone; upper 4 to 6 inches of soil washed away; depth to limestone rock is 5 to 30 feet.	0–18 18–72	Cherty silty clay loam. Cherty clay
BoE	Bodine cherty silt loam, 20 to 45 percent slopes.	Very cherty soils on steep hillsides; formed from cherty limestone; depth to bedrock is 2 to 10 feet.	0–8 8–60	Cherty silt loam Cherty silt loam
Br	Bruno loamy sand.	Very sandy soil on first bottoms; flooded nearly every winter.	0–60	Loamy sand
CaB	Captina silt loam, 1 to 3 percent slopes.	Moderately well drained soil with a fragipan; on low terraces and foot slopes; 2 to 3 feet to seasonally high water table [2]; limestone bedrock at depth of 5 to 30 feet.	0–10 10–24 24–40 40–60	Silt loam Silt loam Silt loam Silty clay loam
ChB2 ChC	Christian silt loam, 2 to 5 percent slopes, eroded. Christian silt loam, 5 to 12 percent slopes.	Well-drained soils on rolling and hilly uplands; formed from siltstone and limestone; depth to rock is 3 to 10 feet.	0–8 8–60	Silt loam Silty clay

See footnotes at end of table.

chanical analyses. They are briefly described in the following subsection.

Engineering classification of soils

Most highway engineers classify soil materials according to the system of the American Association of State Highway Officials (*1*). In this system there are seven principal groups. These groups range from A–1, consisting of gravelly soils having a high load-carrying capacity, to A–7, consisting of clay soils having a poor load-carrying capacity when wet. Within each group the relative engineering value of the soil material is indicated by a group index number. Group indexes range from 0 for the best material to 20 for the poorest. In table 4 the group index is shown in parentheses following the soil group symbol.

Some engineers prefer the Unified soil classification system (*11*). In this classification soil materials are identified as coarse grained (eight classes), fine grained (six classes), or highly organic.

The classification of a soil material by either the AASHO or the Unified system identifies that soil material with regard to gradation of particle sizes and plasticity characteristics. The classification enables the engineer to evaluate the soil material rapidly by comparing it with more familiar soils that have the same classification. Table 5 lists these two engineering classifications and the corresponding USDA textural class for each soil in the county.

estimated physical and chemical properties

for an estimate, or does not apply]

Classification—Continued		Percentage passing sieve—			Permeability	Available water capacity	Reaction [1]	Structure	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)					
					Inches per hour	*Inches per inch of soil*			
ML or CL	A–4	90–100	85–100	55–85	2.5–5.0	0.15–0.20	4.5–5.5	Granular	Low.
CL	A–6 or A–7	90–100	85–100	55–80	0.8–2.5	0.15–0.20	4.5–5.5	Blocky	Moderate.
CL	A–6 or A–7	85–100	80–100	55–80	0.8–2.5	0.15–0.20	4.5–5.5	Blocky	Moderate.
CL	A–6 or A–7	90–100	85–100	55–80	0.8–2.5	0.15–0.20	4.5–5.5	Blocky	Moderate.
CL	A–6 or A–7	85–100	80–100	55–80	0.8–2.5	0.15–0.20	4.5–5.5	Blocky	Moderate.
SM or SC	A–4	70–85	60–85	40–50	2.5–5.0	0.10–0.15	4.5–5.5	Granular	Low.
CL	A–6	70–85	65–85	50–60	0.8–2.5	0.10–0.15	4.5–5.5	Blocky	Low.
ML or CL	A–4	70–85	60–80	55–75	2.5–5.0	0.10–0.15	5.1–5.5	Granular	Low.
MH or CH	A–7	75–85	65–85	60–80	0.8–2.5	0.10–0.15	5.1–5.5	Blocky	Moderate.
CH	A–7	65–85	60–85	55–80	0.8–2.5	0.05–0.15	4.5–5.0	Blocky	Moderate.
MH or CH	A–7	70–85	65–85	60–75	0.8–2.5	0.10–0.15	5.1–5.5	Blocky	Moderate.
CH	A–7	65–85	60–85	55–80	0.8–2.5	0.05–0.15	4.5–5.0	Blocky	Moderate.
ML or GM	A–4	50–80	45–70	40–60	2.5–5.0	0.05–0.10	5.1–5.5	Granular	Low.
GM or GC	A–2 or A–4	30–50	25–45	20–45	2.5–5.0	0.05–0.10	4.5–5.0	Blocky	Low.
SM	A–2	80–95	75–90	20–35	5.0–10	0.05–0.10	5.6–6.0	Single grain	Low.
ML	A–4	95–100	90–100	75–90	0.8–2.5	0.15–0.20	5.1–5.5	Granular	Low.
ML or CL	A–4	95–100	90–100	85–95	0.8–2.5	0.15–0.20	5.1–5.5	Blocky	Low.
ML or CL	A–6	95–100	90–100	80–95	0.2–0.8	0.10–0.15	4.5–5.0	Massive	Low.
CL or MH	A–6 or A–7	85–100	85–100	75–90	0.8–2.5	0.10–0.15	4.5–5.0	Blocky	Moderate.
ML or CL	A–4	90–100	90–100	65–80	0.8–2.5	0.15–0.20	5.1–5.5	Granular	Low.
MH or CH	A–7	90–100	90–100	80–95	0.2–0.8	0.10–0.15	4.5–5.0	Blocky	Moderate.

TABLE 5.—*Brief description of soils and their estimated*

Map symbol	Soil	Description of soil and site	Depth from surface	Classification
				USDA texture
	Continued—			
ChC2	Christian silt loam, 5 to 12 percent slopes, eroded.			
ChD	Christian silt loam, 12 to 20 percent slopes.			
ChD2	Christian silt loam, 12 to 20 percent slopes, eroded.		*Inches*	
CnC3	Christian silty clay loam, 5 to 12 percent slopes, severely eroded.	Well-drained soils on rolling and hilly uplands; formed from siltstone and limestone; upper 4 to 6 inches of soil washed away; depth to rock is 3 to 8 feet.	0–6 6–50	Silty clay loam Silty clay
CnD3	Christian silty clay loam, 12 to 20 percent slopes, severely eroded.			
Co	Cobbly alluvial land.	Cobbly land on first bottoms; flooded nearly every winter; bedrock at depth of 4 to 15 feet.	0–30	Very cobbly sandy loam.
CsA	Cumberland silt loam, 0 to 2 percent slopes.	Well-drained soils on high terraces; formed in old alluvium; depth to bedrock is 6 to 30 feet.	0–10 10–24 24–85	Silt loam Clay or clay loam Clay
CsB	Cumberland silt loam, 2 to 5 percent slopes.			
CsC2	Cumberland silt loam, 5 to 12 percent slopes, eroded.			
CuC3	Cumberland silty clay loam, 5 to 12 percent slopes, severely eroded.	Well-drained soils on high terraces; formed in old alluvium; upper 4 to 6 inches of soil washed away; depth to bedrock is 6 to 30 feet.	0–30 30–85	Clay or silty clay loam. Clay
CuD3	Cumberland silty clay loam, 12 to 20 percent slopes, severely eroded.			
DkB	Dickson silt loam, 1 to 4 percent slopes.	Moderately well drained soil with a fragipan; on uplands and foot slopes; 2 to 3 feet to seasonally high water table; depth to limestone rock is 6 to 30 feet.	0–10 10–24 24–38 38–50	Silt loam Silt loam Silt loam Silty clay loam
Du	Dunning silty clay loam.	Very poorly drained black soils on first bottoms; flooded nearly every winter.	0–10 10–60	Silty clay loam Silty clay or clay
Ek	Elkins silt loam.	Very poorly drained black soil in upland depressions.	0–30	Silt loam
EtC	Etowah cherty silt loam, 5 to 12 percent slopes.	Well-drained cherty soils on foot slopes and terraces; chert is mostly less than 3 inches across; bedrock at depth of 5 to 15 feet.	0–16 16–42	Cherty silt loam Cherty silty clay loam.
EtD	Etowah cherty silt loam, 12 to 20 percent slopes.			
EtE	Etowah cherty silt loam, 20 to 30 percent slopes.			
EwB	Etowah silt loam, 2 to 5 percent slopes.	Well-drained soils on foot slopes and terraces; bedrock at depth of 5 to 30 feet.	0–14 14–50	Silt loam Silty clay loam
EwC	Etowah silt loam, 5 to 12 percent slopes.			
EwD	Etowah silt loam, 12 to 20 percent slopes.			
Gd	Gullied land.	Land consisting of a network of shallow and deep gullies; soil material between the gullies formed from limestone and is fine textured; bedrock at depth of 0 to 30 feet.	(2)	Clay or cherty clay
Gu	Guthrie silt loam.	Poorly drained soil on upland flats; formed in 2 to 3 feet of loess over limestone; bedrock at depth of 10 to 30 feet; seasonally high water table at depth of less than 1 foot.	0–35 35–50 50–72	Silt loam Silty clay loam Silty clay
HaB	Hartsells loam, 2 to 5 percent slopes.	Well-drained soils on Cumberland Plateau uplands; formed from sandstone; bedrock at depth of 2 to 6 feet.	0–10 10–36	Loam Clay loam or loam
HaC	Hartsells loam, 5 to 12 percent slopes.			
Hr	Huntington cherty silt loam.	Well-drained cherty soil on first bottoms; formed from cherty limestone; flooded for a few days in winter; bedrock at depth of 5 to 25 feet.	0–40	Cherty silt loam

See footnotes at end of table.

physical and chemical properties—Continued

Classification—Continued		Percentage passing sieve—			Perme-ability	Available water capacity	Reaction [1]	Structure	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)					
					Inches per hour	*Inches per inch of soil*			
MH or CH	A-6	90–100	90–100	80–95	0. 2–0. 8	0. 10–0. 15	4. 5–5. 0	Blocky	Moderate.
MH or CH	A-7	90–100	90–100	80–95	0. 2–0. 8	0. 10–0. 15	4. 5–5. 0	Blocky	Moderate.
GM or GC	A-1 or A-2	30–50	25–40	20–30	2. 5–5. 0	<0. 05	4. 5–5. 0	(2)	Low.
ML or CL	A-4	95–100	90–100	60–80	0. 8–2. 5	0. 15–0. 20	4. 5–5. 5	Granular	Low.
ML or CL	A-5, A-6, or A-7.	95–100	90–100	65–85	0. 8–2. 5	0. 15–0. 20	4. 5–5. 5	Blocky	Moderate.
ML or CL	A-5 or A-6	95–100	90–100	65–85	0. 8–2. 5	0. 15–0. 20	4. 5–5. 5	Blocky	Moderate.
ML or CL	A-5, A-6, or A-7.	95–100	90–100	65–85	0. 8–2. 5	0. 15–0. 20	4. 5–5. 5	Blocky	Moderate.
ML or CL	A-5 or A-6	95–100	90–100	65–85	0. 8–2. 5	0. 15–0. 20	4. 5–5. 5	Blocky	Moderate.
ML	A-4	95–100	90–100	70–90	0. 8–2. 5	0. 15–0. 20	5. 1–5. 5	Granular	Low.
ML or CL	A-4	95–100	90–100	85–95	0. 8–2. 5	0. 15–0. 20	5. 1–5. 5	Blocky	Low.
ML or CL	A-6	95–100	90–100	80–95	0. 2–0. 8	0. 10–0. 15	4. 5–5. 0	Massive	Low.
ML or CL	A-6 or A-7	85–100	80–100	75–90	0. 8–2. 5	0. 10–0. 15	4. 5–5. 0	Blocky	Moderate.
MH	A-6	95–100	90–100	80–95	0. 2–0. 8	0. 15–0. 20	6. 1–7. 3	Granular	Moderate.
MH	A-7	95–100	90–100	80–95	0. 2–0. 8	0. 15–0. 20	6. 1–6. 5	Blocky	High.
ML	A-4	95–100	90–100	85–95	0. 8–2. 5	0. 20–0. 25	4. 5–5. 0	Massive	Low.
ML or CL	A-4	75–95	70–90	55–75	2. 5–5. 0	0. 10–0. 15	5. 6–6. 0	Granular	Low.
ML or CL	A-4 or A-6	75–90	70–90	60–75	2. 5–5. 0	0. 10–0. 15	5. 1–5. 5	Blocky	Moderate.
ML or CL	A-4	90–100	85–95	70–80	0. 8–2. 5	0. 20–0. 25	5. 6–6. 0	Granular	Moderate.
ML or CL	A-4 or A-6	90–100	85–95	70–85	0. 8–2. 5	0. 15–0. 20	5. 1–5. 5	Blocky	Moderate.
CH or MH	A-7	70–100	65–100	60–100	(2)	(2)	4. 5–5. 5	(2)	Moderate.
ML	A-4	95–100	90–100	85–95	0. 2–0. 8	0. 15–0. 20	4. 5–5. 0	Granular	Low.
CL	A-6	95–100	90–100	85–95	0. 2–0. 8	0. 10–0. 15	4. 5–5. 0	Massive	Low.
CH	A-7	95–100	90–100	80–90	0. 2–0. 8	0. 10–0. 15	4. 5–5. 0	Massive	Moderate.
ML or CL	A-4	95–100	90–100	55–85	0. 8–2. 5	0. 15–0. 20	4. 5–5. 0	Granular	Low.
ML or CL	A-4 or A-6	95–100	90–100	55–80	0. 8–2. 5	0. 15–0. 20	4. 5–5. 0	Blocky	Low.
ML or CL	A-4	70–90	60–80	50–70	0. 8–2. 5	0. 10–0. 15	5. 6–6. 5	Granular	Low.

TABLE 5.—*Brief description of soils and their estimated*

Map symbol	Soil	Description of soil and site	Depth from surface	Classification
				USDA texture
			Inches	
Hu	Huntington silt loam.	Well-drained loamy soil on first bottoms; flooded for a few days in winter.	0–40	Silt loam
JeB JeC JeD JeD3	Jefferson loam, 2 to 5 percent slopes. Jefferson loam, 5 to 12 percent slopes. Jefferson loam, 12 to 20 percent slopes. Jefferson loam, 12 to 20 percent slopes, severely eroded.	Well-drained soils formed in old alluvium derived from sandstone and shale; bedrock at depth of 8 to 25 feet.	0–10 10–30 30–50	Loam Loam or clay loam Loam or clay loam
JsD	Jefferson cobbly sandy loam, 5 to 20 percent slopes.	Well-drained cobbly soils formed in local alluvium on foot slopes and benches; cobbles 3 to 10 inches across on surface and in profile; bedrock at depth of 3 to 25 feet.	0–10 10–50	Cobbly sandy loam Cobbly sandy clay loam.
La	Lawrence silt loam.	Somewhat poorly drained soil with a fragipan; depth to bedrock is 15 to 30 feet; seasonally high water table at a depth of less than 1 foot.	0–8 8–24 24–45 45–60	Silt loam Silt loam Silt loam Silty clay loam
Ln	Lindside silt loam.	Moderately well drained or somewhat poorly drained loamy soil on first bottoms; flooded for a few days nearly every winter.	0–10 10–40	Silt loam Silt loam
LrB LrC	Linker loam, 2 to 5 percent slopes. Linker loam, 5 to 12 percent slopes.	Well-drained soils on uplands of the Cumberland Plateau; formed from acid sandstone; bedrock at depth of 2.5 to 8 feet.	0–10 10–40 40–50	Loam Clay loam Sandy Clay loam
Me	Melvin silt loam.	Poorly drained silty soil on first bottoms; flooded for a few days nearly every winter.	0–10 10–30	Silt loam Silt loam
MnB MnC	Minvale silt loam, 2 to 5 percent slopes. Minvale silt loam, 5 to 12 percent slopes.	Well-drained soils on foot slopes in the Highland Rim; formed in old alluvium from limestone soils; bedrock is at depth of 5 to 30 feet.	0–12 12–50	Silt loam Silty clay loam
MoB MoC MoC3	Mountview silt loam, 2 to 5 percent slopes. Mountview silt loam, 5 to 12 percent slopes. Mountview silt loam, 5 to 12 percent slopes, severely eroded.	Well-drained soils on uplands of the Highland Rim; formed in 2 to 3 feet of loess over residuum from limestone; bedrock at depth of 8 to 30 feet.	0–10 10–36 36–60	Silt loam Silt loam Cherty clay or clay
RaC RaD RaE	Ramsey loam, 5 to 12 percent slopes. Ramsey loam, 12 to 20 percent slopes. Ramsey loam, 20 to 30 percent slopes.	Well-drained to excessively drained soils on sloping to steep uplands of the Cumberland Plateau; acid sandstone bedrock at depth of 10 to 24 inches.	0–7 7–24	Loam Loam or sandy loam
RcD	Ramsey very rocky sandy loam, 10 to 20 percent slopes.	Excessively drained, very rocky, moderately steep soils on the Cumberland Plateau; between 15 and 50 percent of surface covered by sandstone; bedrock at depth of 0 to 2 feet.	0–6 6–24	Sandy loam Sandy loam
RfE	Ramsey-Jefferson stony complex, 20 to 45 percent slopes.	See the descriptions and estimates given for the Ramsey soils and the Jefferson soils.		
Ro	Rock land.	More than 50 percent of surface covered by limestone.	--------	--------
Sa	Sango silt loam.	Moderately well drained soil with a fragipan; formed from 2 to 3 feet of loess over residuum from limestone; depth to bedrock is 15 to 30 feet; seasonally high water table at a depth of 1½ feet.	0–8 8–24 24–40 40–60	Silt loam Silt loam Silt loam Silty clay or clay

See footnotes at end of table.

physical and chemical properties—Continued

Classification—Continued		Percentage passing sieve—			Permeability	Available water capacity	Reaction [1]	Structure	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)					
					Inches per hour	*Inches per inch of soil*			
ML or CL	A–4 or A–6	95–100	90–100	75–90	0.8–2.5	0.20–0.25	5.6–6.5	Granular	Low.
ML	A–4	95–100	90–100	55–75	0.8–2.5	0.15–0.20	5.1–5.5	Granular	Low.
CL	A–6	95–100	90–100	60–80	0.8–2.5	0.15–0.20	4.5–5.0	Blocky	Low.
ML or CL	A–6	95–100	90–100	60–75	0.8–2.5	0.15–0.20	4.5–5.0	Blocky	Low.
SM or SC	A–4	70–85	60–85	40–50	2.5–5.0	0.10–0.15	4.5–5.5	Granular	Low.
CL	A–4 or A–6	70–85	60–85	50–60	0.8–2.5	0.10–0.15	4.5–5.5	Blocky	Low.
ML	A–4	95–100	95–100	85–95	0.8–2.5	0.15–0.20	4.5–5.0	Granular	Low.
ML or CL	A–4	95–100	95–100	85–95	0.8–2.5	0.15–0.20	4.5–5.0	Blocky	Low.
CL	A–4	95–100	95–100	80–95	0.2–0.8	0.10–0.15	4.5–5.0	Massive	Low.
CL	A–6 or A–7	90–100	85–100	70–90	0.2–0.8	0.10–0.15	4.5–5.0	Blocky	Moderate.
ML or CL	A–6	95–100	85–100	75–90	0.8–2.5	0.20–0.25	5.6–6.5	Granular	Moderate.
ML or CL	A–6	95–100	85–100	70–90	0.8–2.5	0.15–0.20	5.6–6.5	Massive	Moderate.
ML or CL	A–4	95–100	90–100	60–70	0.8–2.5	0.15–0.20	4.5–5.0	Granular	Low.
CL	A–6	95–100	90–100	60–75	0.8–2.5	0.10–0.15	4.5–5.0	Blocky	Moderate.
CL	A–4 or A–6	95–100	90–100	50–75	0.8–2.5	0.10–0.15	4.5–5.0	Massive	Low.
ML	A–6	95–100	90–100	85–95	0.8–2.5	0.15–0.20	5.6–6.5	Granular	Moderate.
ML or CL	A–6	95–100	90–100	85–95	0.2–0.8	0.15–0.20	5.6–6.5	Massive	Moderate.
ML	A–4	90–100	80–95	55–75	0.8–2.5	0.15–0.20	5.1–5.5	Granular	Low.
CL	A–6	90–100	80–95	75–85	0.8–2.5	0.15–0.20	5.1–5.5	Blocky	Moderate.
ML	A–4	95–100	90–100	85–95	0.8–2.5	0.15–0.20	4.5–5.0	Granular	Low.
ML or CL	A–4	95–100	90–100	85–95	0.8–2.5	0.15–0.20	4.5–5.0	Blocky	Low.
CH or MH	A–7	75–100	70–100	60–95	0.8–2.5	0.10–0.15	4.5–5.0	Blocky	Moderate.
ML or SM	A–4 or A–2	70–90	60–85	30–60	2.5–5.0	0.10–0.15	4.5–5.0	Granular	Low.
ML or SM	A–4 or A–2	70–80	55–85	30–60	2.5–5.0	0.10–0.15	4.5–5.0	Blocky	Low.
ML or SM	A–4 or A–2	70–90	60–80	30–60	2.5–5.0	0.05–0.10	4.5–5.0	Granular	Low.
ML or SM	A–4 or A–2	70–80	60–80	30–60	2.5–5.0	0.05–0.10	4.5–5.0	Blocky	Low.
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ML	A–4	95–100	90–100	85–95	0.8–2.5	0.15–0.20	4.5–5.0	Granular	Low.
ML or CL	A–4	95–100	90–100	85–95	0.8–2.5	0.15–0.20	4.5–5.0	Blocky	Low.
ML or CL	A–4 or A–6	90–100	85–100	80–90	0.2–0.8	0.10–0.15	4.5–5.0	Massive	Moderate.
CH or MH	A–6 or A–7	90–100	80–100	70–90	0.2–0.8	0.10–0.15	4.5–5.0	Blocky	Moderate.

TABLE 5.—*Brief description of soils and their estimated*

Map symbol	Soil	Description of soil and site	Depth from surface	Classification
				USDA texture
			Inches	
SeA SeB SeC2	Sequatchie loam, 0 to 2 percent slopes. Sequatchie loam, 2 to 5 percent slopes. Sequatchie loam, 5 to 12 percent slopes, eroded.	Well-drained soils on low second bottoms or terraces; formed in mixed alluvium; limestone bedrock at depth of 5 to 12 feet.	0–10 10–40	Loam Loam or clay loam
StA StD	Staser sandy loam, 0 to 2 percent slopes. Staser sandy loam, 10 to 25 percent slopes.	Well-drained soils on first bottoms; formed from limestone and sandstone; flooded for a few days in winter. Bedrock at depth of 5 to 15 feet.	0–40	Sandy loam
Su	Stony colluvial land.	Stony and cobbly soil on steep talus slopes of the Cumberland Plateau escarpment; stones, cobbles, and some boulders occupy 15 to 50 percent of the surface; depth to bedrock is 2 to 20 feet.	(2)	(2)
SwC2	Swaim silt loam, 3 to 10 percent slopes, eroded.	Well-drained clayey soils in old local alluvium on foot slopes and benches; depth to bedrock is 3 to 10 feet.	0–6 6–14 14–60	Silt loam Silty clay loam Silty clay or clay
TaC	Talbott silt loam, 5 to 12 percent slopes.	Well-drained, fine-textured soil on rolling uplands; formed in residuum from limestone; depth to bedrock is 2 to 5 feet.	0–7 7–30 30–70	Silt loam Clay or silty clay Clay
TrC2 TrE2	Talbott very rocky complex, 5 to 20 percent slopes, eroded. Talbott very rocky complex, 20 to 30 percent slopes, eroded.	Well-drained, fine-textured soils on uplands; bedrock outcrops occupy 15 to 50 percent of the surface; bedrock is at depth of 0 to 3 feet.	0–5 5–20	Silty clay loam Clay
WcC3 WcD3 WcE3	Waynesboro clay loam, 5 to 12 percent slopes, severely eroded. Waynesboro clay loam, 12 to 20 percent slopes, severely eroded. Waynesboro clay loam, 20 to 30 percent slopes, severely eroded.	Well-drained soils formed in old alluvium on high terraces; upper 4 to 6 inches of soil washed away.	0–18 18–72	Clay loam Clay loam or clay
WgD3	Waynesboro gravelly clay loam, 12 to 30 percent slopes, severely eroded.	Well-drained soils formed in gravelly alluvium on high terraces; depth to bedrock is 5 to 25 feet.	0–40	Gravelly loam to gravelly clay loam.
WsC2	Waynesboro gravelly sandy loam, 5 to 12 percent slopes, eroded.	Well-drained, gravelly soils formed in alluvium on high terraces; depth to bedrock is 5 to 25 feet.	0–7 7–48	Gravelly sandy loam Gravelly clay loam to gravelly sandy loam.
WaA WaB WaC WaC2 WaD2 WaE	Waynesboro loam, 0 to 2 percent slopes. Waynesboro loam, 2 to 5 percent slopes. Waynesboro loam, 5 to 12 percent slopes. Waynesboro loam, 5 to 12 percent slopes, eroded. Waynesboro loam, 12 to 20 percent slopes, eroded. Waynesboro loam, 20 to 30 percent slopes.	Well-drained soils formed in old alluvium on high terraces; depth to bedrock is 5 to 30 feet.	0–10 10–25 25–50	Loam Clay loam Clay loam or clay
Ww	Whitwell loam.	Moderately well drained or somewhat poorly drained loamy soil on low terraces and second bottoms; formed in mixed alluvium; depth to bedrock is 5 to 25 feet.	0–10 10–40 40–60	Loam Loam or clay loam Loam

[1] pH before liming.
[2] Variable.

physical and chemical properties—Continued

Classification—Continued		Percentage passing sieve—			Permeability	Available water capacity	Reaction [1]	Structure	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)					
					Inches per hour	*Inches per inch of soil*			
ML or CL	A-4	95–100	90–100	60–75	0. 8–2. 5	0. 15–0. 20	5. 1–6. 0	Granular	Low.
ML or CL	A-6	95–100	90–100	65–80	0. 8–2. 5	0. 15–0. 20	5. 1–6. 0	Blocky	Low.
SM or ML	A-4	95–100	90–100	45–60	0. 8–2. 5	0. 15–0. 20	5. 6–6. 5	Granular	Low.
(2)	(2)				2. 5–5. 0	(2)	0. 05–0. 10	(2)	(2).
ML or CL	A-4	90–100	75–95	65–75	0. 8–2. 5	0. 15–0. 20	5. 1–5. 5	Granular	Moderate.
MH or CH	A-6 or A-7	95–100	90–100	80–90	0. 2–0. 8	0. 10–0. 15	5. 1–5. 5	Blocky	Moderate.
CH	A-7	95–100	90–100	80–100	0. 2–0. 8	0. 10–0. 15	5. 1–5. 5	Blocky	High.
ML	A 4	95 100	95 100	90-100	0. 8–2. 5	0. 15–0. 20	5. 1–5. 5	Granular	Moderate.
MH or CH	A-6 or A-7	95–100	95–100	90–100	0. 2–0. 8	0. 10–0. 15	5. 1–5. 5	Blocky	High.
CH	A-7	95–100	95–100	95–100	0. 2–0. 8	0. 10–0. 15	5. 1–5. 5	Blocky	High.
ML or CL	A-7	85–95	70–90	60–85	0. 2–0. 8	0. 05–0. 10	5. 1–5. 5	Blocky	Moderate to high.
MH or CH	A-7	85–95	85–95	85–95	0. 2–0. 8	0. 05–0. 10	5. 1–5. 5	Blocky	High.
MH or CL	A-6 or A-7	90-100	85–95	55–75	0. 8–2. 5	0. 12–0. 20	4. 5–5. 5	Blocky	Moderate.
MH, CL or CH	A-6 or A-7	90–100	85–95	55–75	0. 8–2. 5	0. 10–0. 15	4. 5–5. 5	Blocky	Moderate.
SM, GM, or CL	A-2 or A-4	60–90	50–85	35–65	0. 8–2. 5	0. 10–0. 15	4. 5–5. 0	Blocky	Moderate.
SM or ML	A-2 or A-4	60–85	50–75	35–60	0. 8–2. 5	0. 15–0. 20	5. 0–5. 5	Granular	Low.
GM or CL	A-2 or A-4	60–95	50–85	35–65	0. 8–2. 5	0. 10–0. 15	5. 1–5. 5	Blocky	Moderate.
ML or CL	A-4	95–100	90–100	55–75	0. 8–2. 5	0. 15–0. 20	4. 5–5. 5	Granular	Low.
ML or CL	A-6 or A-7	95–100	90–100	55–85	0. 8–2. 5	0. 12–0. 20	4. 5–5. 5	Blocky	Moderate.
MH, CL, or CH	A-6 or A-7	95–100	90–100	55–75	0. 8–2. 5	0. 10–0. 15	4. 5–5. 5	Blocky	Moderate.
ML	A-4	95–100	90–100	60–75	0. 8–2. 5	0. 15–0. 20	5. 1 5. 5	Granular	Low.
ML or CL	A 4 or A 6	95-100	90–100	60–80	0. 8–2. 5	0. 15–0. 20	5. 1–5. 5	Blocky	Low.
ML or CL	A-4 or A-6	95–100	90–100	60–75	0. 8–2. 5	0. 15–0. 20	5. 1–5. 5	Blocky	Low.

Engineering descriptions

A brief description of each soil in the county is given in table 5. The depth to bedrock is based on field observations. Also given in the table, for the principal horizons, are the agricultural and engineering classifications of soil material, the percentage of material passing sieves of various sizes, and some characteristics of the soil material significant to engineering.

Permeability is estimated for uncompacted soil material. The estimates are based on the structure and consistence of the soil and on field observations. Only a small amount of laboratory data was available.

Available water, in inches per inch of soil depth, is the approximate amount of capillary water present when the soil is wet to field capacity. It is the amount of water held in the soil between 1/3 atmosphere and 15 atmospheres of tension. If the soil is at the permanent wilting point, the amount of water listed will wet the soil to a depth of 1 inch. Laboratory data suitable for estimating available water were compiled for only a few soils in Warren

Table 6.—*Interpretation of*

[Omitted from this table are

Soil series [1] and map symbols	Suitability as source of—			Soil features affecting—	
	Topsoil [2]	Sand and gravel	Road fill	Highway location	Farm Ponds: Reservoir area
Allen (AaD3, AcD, AcE, AnB, AnC, AnD, AnE).	Poor	Unsuitable	Good	Unstable slopes; slips and slides in cut slopes.	Moderate permeability
Baxter (BaC, BaD, BaE, BaF, BcC3, BcD3, BcE3).	Poor	Unsuitable	Good	Steep slopes in places	Moderate permeability
Bodine (BoE)	Poor	Fair for gravel	Good	Steep slopes; bedrock within 6 feet of surface.	Rapid permeability
Bruno (Br)	Poor	Fair for sand	Good	Flooding	Very rapid permeability
Captina (CaB)	Fair	Unsuitable	Fair	Seasonal perched water table.	Low risk of seepage if pond is built above pan layer.
Christian (ChB2, ChC, ChC2, ChD, ChD2, CnC3, CnD3).	Poor	Unsuitable	Fair to poor	Rock at depth of 3 to 8 feet.	([3])
Cobbly alluvial land (Co)	Unsuitable	Good	Good	Many stones and boulders.	Very rapid permeability
Cumberland (CsA, CsB, CsC2, CuC3, CuD3).	Fair	Unsuitable	Fair to poor	([3])	Moderate permeability; underlain by cavernous limestone.
Dickson (DkB)	Fair	Unsuitable	Poor	Seasonal perched water table.	Low risk of seepage if pond is built above pan layer.
Dunning (Du)	Poor	Unsuitable	Poor	Flooding	([3])
Elkins (Ek)	Poor	Unsuitable	Poor	Flooding	([3])
Etowah (EtC, EtD, EtE, EwB, EwC, EwD).	Fair	Unsuitable	Fair to good	([3])	Rapid permeability; underlain by cavernous limestone.
Guthrie (Gu)	Poor	Unsuitable	Poor	High water table; ponding.	Good for pit ponds
Hartsells (HaB, HaC)	Fair	Unsuitable	Good	Sandstone bedrock within 7 feet of surface.	([3])
Huntington (Hr, Hu)	Good	Generally unsuitable but fair in cherty areas.	Fair	Flooding	Rapid permeability
Jefferson (JeB, JeC, JeD, JeD3, JsD).	Fair	Unsuitable	Fair to good	([3])	([3])
Lawrence (La)	Poor	Unsuitable	Poor	Seasonally high water table; some ponding.	([3])
Lindside (Ln)	Good	Unsuitable	Poor to fair	Flooding	([3])
Linker (LrB, LrC)	Fair	Unsuitable	Fair to good	([3])	([3])
Melvin (Me)	Poor	Unsuitable	Poor	Flooding	([2])
Minvale (MnB, MnC)	Fair	Unsuitable	Fair	([3])	Moderate permeability

See footnotes at end of table.

County; for the other soils, the estimates are based on data for similar soils.

The soil reaction, or pH, is estimated on the basis of field observations and laboratory tests.

The shrink-swell potential indicates the change in volume to be expected when the moisture content changes. It is estimated mainly on the basis of the amount and type of clay a soil contains. In general, soils classified as CH and A–7 have a moderate to high shrink-swell potential. Soils having a low shrink-swell potential are clean sands and gravels (single-grain structure), soils that have small amounts of nonplastic to slightly plastic fines, and most other nonplastic to slightly plastic soils.

Features affecting engineering work

In table 6 the soils of the county are rated according to their suitability as a source of topsoil, sand and gravel, and road fill. Also listed are soil features that affect highway construction and agricultural engineering. In the last column of table 6, the soils are rated according to the limitations that restrict their use as disposal fields for septic tanks.

engineering properties of soils
Gullied land (Gd) and Rock land (Ro)]

Soil features affecting—Continued—				Degree and kind of limitations for septic tank disposal fields
Farm Ponds—Continued: Embankment	Agricultural drainage	Irrigation	Terraces and diversions	
(3)	Not needed	Strong slopes	Steep slopes in places; soil material cobbly in places.	Slight to severe; slope.
(3)	Not needed	Moderate water-holding capacity; steep slopes.	Steep slopes in places	Slight to severe; slope.
Very cherty and porous	Not needed	Poor soil for farming	Steep slopes	Moderate or severe; slope.
Very rapid permeability	Not needed	Very low water-holding capacity.	Not needed	Severe; flooding.
Easily eroded	Not needed	(3)	(3)	Severe; flooding.
Good for core walls in embankments.	Not needed	Moderate water-holding capacity; strong slopes.	Moderately steep slopes in places.	Slight to severe; slope.
Stones and boulders; very rapid permeability.	Not needed	Poor soil for farming	Stones and boulders	Severe; flooding and very rapid permeability.
(3)	Not needed	(3)	Strong slopes in some places.	Slight or moderate; slope.
Easily eroded on slopes	Not needed	(3)	(3)	Severe; slow permeability.
Clayey; high shrink-swell potential.	Slow permeability; bedding or shallow ditches suitable.	Poorly drained	Not needed	Severe; flooding.
Easily eroded on slopes	Moderately permeable	Poorly drained	Not needed	Severe; flooding.
(3)	Not needed	(3)	Some areas too steep	Slight to severe; slope.
Easily eroded on slopes	Very slow permeability	Poorly drained	Not needed	Severe; ponding or flooding.
(3)	Not needed	(3)	(3)	Moderate to severe; depth to rock.
(3)	Not needed	(3)	Not needed	Slight to severe; flooding.
(3)	Not needed	(3)	(3)	Slight or moderate; slope.
Easily eroded	Slow permeability	Poorly drained; slowly permeable subsoil.	Not needed	Severe; ponding or flooding.
(3)	Flooding; high water table.	(3)	Not needed	Severe; flooding.
(2)	Not needed	(3)	(3)	Slight.
Intermittently wet	High water table; flooding.	Poorly drained	Not needed	Severe; flooding.
(3)	Not needed	(3)	(3)	Slight.

TABLE 6.—*Interpretation of*

Soil series [1] and map symbols	Suitability as source of—			Soil features affecting	
	Topsoil [2]	Sand and gravel	Road fill	Highway location	Farm Ponds — Reservoir area
Mountview (MoB, MoC, MoC3).	Fair	Unsuitable	Poor to fair	([3])	Moderate permeability
Ramsey (RaC, RaD, RaE, RcD).	Poor	Unsuitable	Good	Shallow to rock; steep slopes in places.	Shallow to sandstone rock.
Sango (Sa)	Poor	Unsuitable	Poor	Seasonal perched water table.	([3])
Sequatchie (SeA, SeB, SeC2).	Good	Unsuitable	Fair to good	Flooding in some areas	Moderate to rapid permeability.
Staser (StA, StD)	Good	Poor	Fair to good	Flooding	Moderate to rapid permeability in sandy subsoil.
Stony colluvial land (Sj)	Poor	Poor	Fair to good	Steep slopes; slips and slides when cuts are made in slopes.	Very stony; very steep slopes.
Swaim (SwC2)	Poor	Unsuitable	Poor	Limestone rock within 6 feet of surface.	Shallow to cavernous limestone.
Talbott (TaC, TrC2, TrE2)	Poor	Unsuitable	Poor	Outcrops of limestone	Shallow to cavernous limestone.
Waynesboro (WaA, WaB, WaC, WaC2, WaD2, WaE, WcC3, WcD3, WcE3, WgD3, WsC2).	Fair	Unsuitable	Fair	([3])	Moderate permeability
Whitwell (Ww)	Fair	Unsuitable	Fair	Flooding in some areas	Moderate permeability

[1] Interpretations of the soil series in the Ramsey-Jefferson stony complex, 20 to 45 percent slopes (RfE), can be found by referring to the respective series. This complex is not listed.

The rating for suitability as a source of topsoil refers to a mixture of the upper 3 feet of soil. The soils best suited for road fill are very coarse grained and easily drained, but soils of this kind are few in Warren County. The Baxter and Bodine soils are most suitable. Small areas along streams near the mountains are a source of gravel for construction work (fig. 21).

Chert gravel can be used economically for secondary and county roads, but it normally is not strong enough for use in concrete structures or as base material for primary roads. Although chert can be used as a supplement where a thick course of base material is required, crushed limestone is more satisfactory. In Warren County, limestone is obtained from small quarries, mostly in areas of Rock land and the Talbott very rocky complexes. Sand occurs in deposits of decomposed sandstone that commonly underlie the Linker soils.

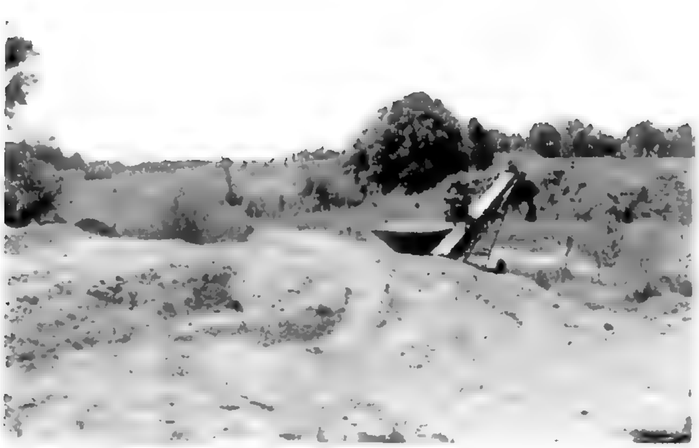

Figure 21.—A source of gravel near Mountain Creek.

The suitability of the soils for highways is affected by drainage, by slope, and by the depth of the soil to bedrock. The Huntington, Elkins, Guthrie, Captina, and other soils in the county are flooded occasionally or have a seasonally high water table. Roads in these soils should be raised above high water by an embankment. Ditches or underdrains may be needed to intercept water that might seep to the surface, as is common at the base of slopes in deposits of local alluvium. Seepage in the back slopes of cuts may cause the overlying material to slump or slide. Unstable slopes can be stabilized by use of kudzu or other suitable cover (fig. 22).

The location of secondary roads in areas where the soils are sloping or steep may be influenced by the depth to bedrock and the kind of bedrock. The engineer determines the type of rock so that he can tell how difficult it will be to excavate. For all highways he investigates the likelihood of slides or other soil movements and of seepage water along or through the bedrock strata. He considers whether the material within or slightly below the subgrade is poor. A layer of highly plastic clay, for example, impedes internal drainage and provides a poor foundation. In some places the clay layer can be cut out before the

engineering properties of soils—Continued

Soil features affecting—Continued—: Farm Ponds—Continued: Embankment	Agricultural drainage	Irrigation	Terraces and diversions	Degree and kind of limitations for septic tank disposal fields
Easily eroded on slopes	Not needed	(3)	(3)	Slight.
Very little soil material	Not needed	Shallow soil	Steep and rocky	Severe; slope and shallow to rock.
Easily eroded on slopes	Not needed	(3)	(3)	Severe; slow permeability.
Soil material permeable but easily compacted.	Not needed	(3)	(3)	Slight.
Soil material permeable but easily compacted.	Not needed	(3)	(3)	Severe; flooding.
Stony; rapid permeability.	Not needed	Poor soil for farming	Steep and stony	Severe; slope.
Clayey soil; high shrink-swell potential.	Not needed	Low water-holding capacity; low response.	Limestone outcrops	Moderate; slow permeability.
Clayey soil; high shrink-swell potential.	Not needed	Low water-holding capacity; low response.	Limestone outcrops	Severe; slow permeability and slope.
(3)	Not needed	(3)	Some areas have steep slopes.	Slight to severe; slope.
(3)	Permeable subsoil; easy to drain.	(3)	(3)	Severe; flooding.

[2] Rating is for upper 3 feet of soil.
[3] Soil properties are favorable for this use.

pavement is constructed. In low, flat, or poorly drained areas, however, cutting out this layer may not be feasible, and the roadway should be built well above it by using an embankment section. Cobbles and stones are likely to cause grading problems.

Farm ponds and their construction are adversely affected by permeable substrata, by bedrock of cavernous limestone, and by inadequate or insufficient material for embankments. If the substrata near the surface are permeable, the water in ponds may be lost through excess seepage. If there are caves in the limestone bedrock, the water may seep through the permeable soil layer and into the cavernous rock.

Figure 22.—**Roadbank on the left is stabilized with kudzu, but the opposite one is bare.**

Slope is among the features that limit the use of soils as disposal fields for septic tanks. In Warren County this limitation is rated as slight for soils on slopes of 0 to 12 percent; moderate for soils on slopes of 12 to 20 percent; and severe for soils on slopes of more than 20 percent. Other features that cause moderate or severe limitations are flooding, a high water table, slow permeability, and shallowness to bedrock.

Managing Soils for Wildlife and Fish[5]

This subsection describes the food and cover needed by wildlife in Warren County, places the soils in groups according to their suitability for wildlife, and explains the groups. A table rates specified plants according to their suitability to the soils in the wildlife groups and as food for listed kinds of wildlife.

Technicians of the U.S. Soil Conservation Service (SCS), who assist the local soil conservation district, maintain up-to-date technical guides for each important kind of wildlife and fish, for each significant food or cover plant, and for the establishment and maintenance of prac-

[5] By FLOYD R. FESSLER, biologist, Soil Conservation Service.

Figure 23.—Streams such as this one originate in the mountains and furnish clear, cool water to many parts of the county. These streams are good for many kinds of fish and for recreation.

tices that protect the soils and conserve water in Warren County. Any landowner can obtain help from the SCS in planning and establishing habitats for suitable kinds of wildlife and fish.

Hunting and fishing are important forms of recreation in this county. Game and fish can be encouraged to live in a particular area by using suitable practices in the management of soils, plants, and water. Managing soils for wildlife also helps to protect the soil and to conserve water.

Food and cover needed by wildlife

The kind of habitat needed by wildlife or fish depends on the species. Some kinds of wildlife live in woodland, others in open farmland. Ducks and some other species require a watery habitat. Some eat only insects and other animal foods, some eat only plant foods, and others eat a combination of the two. Largemouth bass and bluegill prefer warm water, but trout require cold water. Figure 23 shows a typical small stream that furnishes clear, cool water and is good for many kinds of fish.

Following is a brief summary of the food and cover needed by the kinds of wildlife most important in Warren County.

Bobwhite.—Choice foods are acorns, seeds, and other fruits. Bobwhite also eat many insects. The food must be close to sheltering plants that provide shade and protect the birds from predators and adverse weather.

Deer.—Deer live chiefly in wooded areas of 500 acres or more. They feed on the tender growth of grasses, herbs, shrubs, vines, and trees. Also choice are acorns, corn, and soybeans. Sources of water should be no more than 1 mile apart, for deer drink water frequently.

Dove, mourning.—These birds eat only the seeds of plants and do not eat insects, green leaves, or fruits. The seeds must be on open ground because doves do not scratch for food as do other birds. They drink water daily.

Ducks, wild.—Wild ducks prefer their food covered with water, though they feed occasionally on dry land if flooded food is not available. The water should not be deeper

TABLE 7.—*Suitability of soil groups for plants*

[Absence of entry indicates plant may be eaten in small

Plants	Suitability of plants for wildlife groups—							
	1	2	3	4	5	6	7	8
Alfalfa	Suited	Suited	Marginal	Marginal	Not suited	Not suited	Not suited	Not suited
Amaranth (pigweed)	Suited	Suited	Marginal	Marginal	Not suited	Marginal	Not suited	Not suited
Ash	Marginal	Marginal	Marginal	Not suited	Not suited	Marginal	Marginal	Marginal
Barley	Suited	Suited [4]	Suited	Marginal [4]	Not suited	Marginal [4]	Not suited	Not suited
Barnyard grass	Suited	Marginal	Not suited	Not suited	Not suited	Not suited	Suited	Suited
Beautyberry	Suited	Marginal	Not suited	Not suited	Not suited	Not suited	Suited	Suited
Beech	Marginal	Suited	Not suited	Marginal	Not suited	Marginal	Suited	Marginal
Blackberry	Suited	Suited	Not suited	Marginal	Marginal	Marginal	Not suited	Not suited
Blackgum	Marginal	Marginal	Not suited	Marginal	Marginal	Marginal	Marginal	Marginal
Black locust	Not suited	Marginal	Not suited	Marginal	Marginal	Marginal	Not suited	Not suited
Bristlegrass	Marginal	Suited	Not suited	Marginal	Suited	Not suited	Not suited	Not suited
Browntop millet	Suited	Suited [4]	Not suited	Marginal [4]	Not suited	Marginal	Not suited	Not suited
Buckwheat	Suited	Suited [4]	Not suited	Marginal	Not suited	Marginal	Not suited	Not suited
Buttonclover and bur-clover.	Suited	Suited	Suited	Marginal	Not suited	Marginal	Not suited	Not suited
Cherry, black	Suited	Suited	Marginal	Not suited	Marginal	Not suited	Not suited	Not suited
Chinquapin	Not suited	Suited	Not suited	Marginal	Not suited	Marginal	Not suited	Not suited
Chufa	Suited	Not suited	Not suited	Not suited	Not suited	Not suited	Suited	Suited
Clover, crimson and white.	Suited	Suited	Marginal	Suited	Not suited	Marginal	Marginal	Marginal
Corn	Suited	Suited [4]	Suited	Marginal [4]	Not suited	Not suited	Marginal	Marginal
Cowpeas	Suited	Suited [4]	Not suited	Marginal [4]	Not suited	Not suited	Marginal	Marginal
Crabgrass	Suited	Suited	Not suited	Suited	Suited	Marginal	Not suited	Not suited

See footnotes at end of table.

than 15 inches for mallards, pintails, and other ducks that do not dive for their food.

Geese, wild.—Wild geese feed on corn and other grains, and they graze clover, rye, ryegrass, wheat, and other green winter crops. These migratory birds use areas of water for resting and drinking.

Rabbits, cottontail.—Rabbits need brushy areas interspersed with grass. These animals are the primary food of many kinds of predators, and they need a brier-type cover for shelter. Clovers, winter grains, or grasses near this cover provide attractive food for rabbits.

Squirrels.—These animals generally prefer wooded areas that have a mixed stand of trees bearing acorns, nuts, seeds, and other fruits. Squirrels also like corn. They nest in trees and prefer to use den holes in the trees for shelter and for raising their young.

Turkey, wild.—Wild turkeys thrive only in areas of woodland that are 1,000 acres or larger. They eat insects, acorns, grapes, seeds of grasses and pines, and, in winter and spring, green forage. These birds require water daily.

Nongame birds.—Nongame birds of many species differ greatly in the foods they choose. Several species eat nothing but insects, a few eat insects and fruits, and some eat insects, as well as acorns, nut meats, and fruits.

Fish.—Fish suitable for warm-water ponds are largemouth bass, bluegill, redeye sunfish, and channel catfish. For bluegill and sunfish, choice foods are mostly aquatic worms, insects, and insect nymphs and larvae. Small fish are essential food for bass and channel catfish.

The amount of fish food produced is directly related to the fertility of the water. This fertility is affected by the soils of the watershed and somewhat by the soils at the bottom of the pond. Most warm-water ponds need to be fertilized to eliminate troublesome water weeds and to increase fish production. The kind and amount of fertilizer should be adjusted according to the kind of soil. In Warren County a fertilizer that contains nitrogen, phosphate, and potash should be used because the soils generally are low in natural fertility. Liming decreases acidity in ponds. Supplementary feedings help to increase fish production.

Cold-water ponds are needed for rainbow trout and should have a temperature of not more than 70° F. These ponds should not be fertilized, but the fish should be given supplementary feedings. The kind of water needed can be supplied by large springs that occur in many places along the base of the Cumberland Mountains and in a few places on the Highland Rim.

Wildlife suitability groups

The soils in this county have been placed in 10 groups according to their suitability as habitat for specified kinds of wildlife. These groups are described in the following pages. Table 7 rates the suitability of specified plants to the soils of each group. It also rates the suitability of each of these plants as food for birds and animals that live in the county or stop here when migrating.

and the plant use by species of wildlife

amounts, or its use by named wildlife is not known]

Suitability of plants for wildlife groups—Continued		Suitability of plants as food for—										
										Nongame birds that feed on—		
9	10	Bob-white	Deer	Dove	Duck	Geese	Rabbit	Squirrel	Turkey	Fruits [1]	Grain [2] and seeds	Nuts and acorns [3]
Not suited	Not suited		Choice			Choice	Choice					
Not suited	Not suited	Fair		Choice							Fair	
Not suited	Not suited	Fair	Fair		Fair			Fair	Fair		Fair	Fair.
Not suited	Not suited	Fair	Fair	Fair	Choice	Choice	Fair	Choice	Choice		Fair	
Not suited	Not suited			Choice	Choice	Choice					Fair	
Not suited	Not suited	Fair	Fair							Fair	Fair	
Not suited	Not suited	Choice			Choice			Choice	Choice			Choice.
Not suited	Marginal	Choice	Fair					Choice	Choice	Choice		Choice.
Not suited	Not suited	Fair	Fair					Fair	Choice	Choice		
Not suited	Marginal	Fair							Fair			Fair.
Marginal	Marginal	Choice	Fair	Choice	Fair	Fair			Fair		Choice	
Not suited	Not suited	Choice	Fair	Choice	Choice	Fair	Choice		Choice		Choice	
Not suited	Not suited	Fair	Choice	Fair	Fair		Fair		Choice		Fair	
Not suited	Not suited		Choice				Choice		Choice			
Marginal	Marginal	Choice	Fair					Choice	Fair	Choice		
Marginal	Marginal		Fair					Choice	Choice			Choice.
Not suited	Not suited		Choice		Choice	Choice		Choice	Choice			
Not suited	Not suited	Choice	Choice			Choice	Choice		Choice			
Not suited	Not suited	Choice	Choice	Choice	Choice	Choice	Choice	Choice	Choice		Choice	Choice.
Not suited	Not suited	Choice	Choice	Fair			Choice		Choice			
Marginal	Marginal			Fair			Fair		Fair		Choice	

TABLE 7.—*Suitability of soil groups for plants and*

Plants	Suitability of plants for wildlife groups—							
	1	2	3	4	5	6	7	8
Dewberry	Marginal	Suited	Not suited	Marginal	Suited	Marginal	Not suited	Not suited
Dogwood	Not suited	Suited	Suited	Suited	Suited	Marginal	Not suited	Not suited
Elder	Suited	Marginal	Not suited	Not suited	Marginal	Not suited	Suited	Suited
Elm	Marginal	Marginal	Not suited	Marginal	Not suited	Marginal	Marginal	Marginal
Farkleberry	Not suited	Suited	Not suited	Not suited	Not suited	Not suited	Not suited	Not suited
Fescue	Suited	Suited	Suited	Suited	Marginal	Suited	Suited	Suited
Grapes	Suited	Suited	Marginal	Marginal	Not suited	Marginal	Not suited	Not suited
Greenbrier	Suited	Suited	Marginal	Marginal	Suited	Marginal	Not suited	Not suited
Hackberry	Suited	Marginal	Suited	Suited	Suited	Suited	Marginal	Marginal
Hawthorn	Marginal	Marginal	Not suited	Not suited	Marginal	Marginal	Not suited	Not suited
Hazelnut	Suited	Marginal	Marginal	Not suited	Marginal	Not suited	Marginal	Marginal
Hickory	Suited	Suited	Marginal	Marginal	Marginal	Suited	Not suited	Not suited
Honeysuckle	Suited	Suited	Not suited	Marginal	Suited	Marginal	Not suited	Not suited
Huckleberry and blueberry.	Not suited	Suited	Not suited	Marginal	Suited	Suited	Not suited	Not suited
Japanese millet	Suited	Not suited	Not suited	Not suited	Not suited	Not suited	Suited	Suited
Johnsongrass	Suited	Suited	Suited	Not suited	Marginal	Not suited	Not suited	Not suited
Lepedeza, bicolor	Suited	Suired	Marginal	Marginal	Not suited	Marginal	Not suited	Not suited
Lespedeza, annual	Suited	Suited	Suited	Suited	Marginal	Marginal	Marginal	Marginal
Lespedeza, sericea	Suited	Suited	Suited	Suited	Suited	Suited	Not suited	Not suited
Maple	Marginal	Suited	Not suited	Marginal	Marginal	Not suited	Suited	Suited
Milk pea	Suited	Suited	Marginal	Marginal	Marginal	Suited	Not suited	Not suited
Mulberry	Suited	Suited	Not suited	Not suited	Marginal	Not suited	Not suited	Not suited
Oak	Suited	Suited	Marginal	Suited	Marginal	Suited	Suited	Suited
Oats	Marginal	Suited [4]	Not suited	Marginal [4]	Not suited	Marginal	Not suited	Not suited
Panicgrass	Suited	Marginal	Marginal	Not suited	Marginal	Not suited	Suited	Suited
Partridgepea	Not suited	Suited	Marginal	Marginal	Suited	Suited	Not suited	Not suited
Paspalum (grass)	Suited	Marginal	Marginal	Not suited	Marginal	Not suited	Suited	Suited
Pea vine (winter peas)	Suited	Suited [4]	Not suited	Marginal [4]	Not suited	Marginal [4]	Not suited	Not suited
Persimmon	Marginal	Marginal	Not suited	Marginal	Marginal	Marginal	Marginal	Not suited
Pine (seeds)	Not suited	Suited	Suited	Suited	Suited	Suited	Not suited	Not suited
Pokeberry	Suited	Suited	Marginal	Marginal	Suited	Suited	Marginal	Marginal
Privet, common	Suited	Suited	Marginal	Marginal	Suited	Suited	Marginal	Marginal
Pyracantha	Marginal	Suited	Marginal	Marginal	Suited	Suited	Not sutied	Not suited
Ragweed, common	Suited	Suited	Not suited	Marginal	Suited	Marginal	Not suited	Not suited
Ragweed, giant	Suited	Marginal	Not suited	Not suited	Marginal	Not suited	Not suited	Not suited
Redcedar	Not suited	Suited	Suited	Suited	Not suited	Suited	Not suited	Not suited
Rescuegrass	Marginal	Suited	Marginal	Suited	Marginal	Marginal	Marginal	Marginal
Rose, multiflora	Marginal	Suited	Not suited	Suited	Suited	Suited	Not suited	Not suited
Rye	Suited	Suited [4]	Suited	Marginal [4]	Not suited	Marginal [4]	Not suited	Not suited
Ryegrass	Suited	Suited	Suited	Suited	Marginal	Suited	Not suited	Not suited
Sassafras	Not suited	Suited	Marginal	Marginal	Marginal	Marginal	Not suited	Not suited
Serviceberry	Marginal	Suited	Marginal	Suited	Suited	Suited	Not suited	Not suited
Smartweed	Suited	Not suited	Not suited	Not suited	Not suited	Not suited	Suited	Suited
Sorghum, grain [5]	Suited	Suited [4]	Not suited	Marginal [4]	Not suited	Marginal [4]	Suited	Suited
Soybeans	Suited	Suited [4]	Not suited	Suited	Marginal	Not suited	Suited	Suited
Sudangrass	Suited	Suited [4]	Not suited	Not suited	Not suited	Not suited	Suited	Suited
Sumac	Suited	Suited	Suited	Suited	Suited	Suited	Not suited	Not suited
Sunflower	Suited	Suited	Marginal	Suited	Suited	Suited	Not suited	Not suited
Sweetgum	Suited	Marginal	Not suited	Not suited	Not suited	Not suited	Suited	Suited
Sycamore	Suited	Marginal	Not suited	Not suited	Not suited	Not suited	Marginal	Suited
Tickclover	Suited	Suited	Marginal	Marginal	Suited	Marginal	Not suited	Not suited
Tupelo	Marginal	Marginal	Not sulted	Not suited	Not suited	Not suited	Marginal	Marginal
Vetch, hairy	Suited	Suited	Not suited	Marginal	Suited	Marginal	Not suited	Not suited
Virginia creeper	Suited	Suited	Not suited	Not suited	Marginal	Not suited	Marginal	Marginal
Walnut	Marginal	Suited	Suited	Suited	Not suited	Suited	Marginal	Marginal
Wheat	Suited	Suited [4]	Suited	Marginal [4]	Not suited	Marginal [4]	Not suited	Not suited
Yellow-poplar	Marginal	Suited	Not suited	Not suited	Not suited	Suited	Not suited	Not suited

[1] Among fruit eaters common in the county are bluebird, catbird, and mockingbird.
[2] Among grain and seed eaters common in the county are blackbird, cardinal, meadowlark, sparrow, and towhee.
[3] Among nut and acorn eaters common in the county are bluejay, chickadee, grackle, and woodpecker.

the plant use by species of wildlife—Continued

Suitability of plants for wildlife groups—Continued		Suitability of plants as food for—										
										Nongame birds that feed on—		
9	10	Bob-white	Deer	Dove	Duck	Geese	Rabbit	Squirrel	Turkey	Fruits [1]	Grain [2] and seeds	Nuts and acorns [3]
Not suited	Marginal	Choice	Fair				Fair	Fair	Choice	Choice		Choice.
Marginal	Marginal	Choice	Choice					Fair	Choice	Choice		Fair.
Not suited	Marginal		Choice						Fair	Choice		
Marginal	Marginal		Fair					Choice	Fair	Choice	Fair	
Suited	Marginal	Fair	Fair					Fair	Fair	Fair		
Marginal	Not suited		Fair			Fair	Fair					
Marginal	Marginal		Choice					Fair	Choice	Choice		
Marginal	Marginal		Choice				Choice		Fair	Fair		
Marginal	Marginal	Fair	Choice					Fair	Choice	Choice		
Not suited	Not suited		Fair					Fair	Fair	Fair		
Not suited	Marginal							Choice				Choice.
Marginal	Marginal		Fair					Choice	Fair			Choice.
Marginal	Marginal		Choice							Choice		
Suited	Marginal	Fair	Fair					Fair	Fair	Choice		
Not suited	Not suited	Choice		Choice	Choice		Choice				Choice	
Not suited	Marginal	Fair	Fair	Fair							Choice	
Marginal	Not suited	Choice	Choice				Fair	Fair				
Marginal	Not suited	Choice	Choice	Fair			Fair		Fair		Fair	
Marginal	Marginal						Fair					
Marginal	Not suited		Choice					Fair	Fair			
Not suited	Marginal	Choice	Fair				Choice					
Not suited	Not suited	Choice	Fair					Choice	Choice	Choice		
Marginal	Marginal	Choice	Choice		Choice			Choice	Choice			Choice.
Not suited	Not suited	Choice	Choice	Fair	Fair	Choice	Choice	Choice	Choice		Choice	
Suited	Marginal	Choice	Fair	Choice	Choice	Fair	Fair		Choice		Choice	
Not suited	Marginal	Choice										
Not suited	Marginal	Choice	Fair	Choice	Fair	Fair			Choice		Choice	
Not suited	Not suited		Fair				Choice					
Marginal	Marginal		Fair					Fair	Fair	Fair		
Suited	Suited	Choice		Choice				Choice	Choice			Choice.
Marginal	Suited	Fair	Choice	Choice					Fair	Choice		
Marginal	Suited	Fair	Fair							Choice		
Not suited	Marginal	Fair							Choice	Choice		
Not suited	Not suited	Choice	Fair	Choice							Choice	
Not suited	Not suited										Choice	
Marginal	Suited		Fair							Choice		
Marginal	Marginal		Choice			Choice	Choice		Choice			
Marginal	Marginal								Fair	Choice		
Not suited	Not suited	Choice	Choice	Fair	Fair	Fair	Fair	Choice	Choice		Fair	
Marginal	Not suited		Choice		Choice	Choice	Choice		Choice			
Marginal	Marginal	Fair	Choice					Fair	Fair	Choice		
Not suited	Marginal		Fair					Fair		Choice		
Not suited	Not suited				Choice	Fair					Fair	
Not suited	Not suited	Choice	Choice	Choice	Choice	Choice	Choice	Choice	Choice		Choice	
Not suited	Not suited	Fair	Choice	Fair	Choice	Fair	Fair		Choice			
Not suited	Not suited	Choice		Choice	Choice			Fair			Choice	
Marginal	Marginal	Fair	Choice				Fair		Fair	Choice		
Not suited	Not suited	Choice	Choice	Choice				Choice	Fair		Choice	Choice.
Not suited	Not suited	Choice	Fair	Choice				Fair	Choice			Choice.
Not suited	Not suited		Fair								Fair	
Marginal	Marginal	Choice	Choice						Fair			
Not suited	Not suited							Fair		Fair		
Marginal	Not suited	Choice	Choice	Fair			Fair		Fair			
Not suited	Marginal		Fair						Fair	Choice		
Not suited	Marginal							Choice				Choice.
Not suited	Not suited	Choice	Choice	Choice	Choice	Choice	Choice	Choice	Choice		Choice	
Not suited	Marginal							Choice			Fair	

[4] If this plant is grown on the sloping soils in this group, needed practices are contouring, stripcropping, and terracing.

[5] Grain sorghum is a choice food for most grain feeders, but it attracts blackbirds, cowbirds, sparrows, and other unwanted birds. Grain sorghum also rots quickly in this humid climate. These two factors limit the suitability of grain sorghum as a wildlife food.

WILDLIFE SUITABILITY GROUP 1

This group consists of deep, fertile soils on bottom lands and low terraces. The soils are silty or loamy to a depth of 30 inches or more and are well drained to somewhat poorly drained. Slopes are dominantly less than 5 percent. The soils are—

Bruno soils.
Huntington soils.
Lindside soils.
Sequatchie soils.
Staser soils.
Whitwell soils.

These soils are easy to work and produce favorable yields of many kinds of crops. They are especially productive of summer annuals and can be row cropped every year. Many areas are flooded for a few days in winter and spring, but flooding is rare in summer and fall.

WILDLIFE SUITABILITY GROUP 2

This group consists of deep, well-drained soils that have a medium-textured surface layer and subsoil. These soils have a deep root zone and high available moisture capacity. They respond well to management. Slopes are 2 to 12 percent in most places but range to as much as 35 percent. In the group are—

Allen soils.
Cumberland soils.
Etowah soils.
Hartsells soils.
Jefferson soils.
Linker soils.
Minvale soils.
Mountview soils.
Waynesboro soils.

Slope is the main problem in using these soils. The soils produce satisfactory yields of crops grown locally, but few areas are level enough for annual cultivation.

WILDLIFE SUITABILITY GROUP 3

The soils in this group are friable and are easily kept in good tilth, but they have a fragipan, at a depth of about 2 feet, that restricts penetration of roots. Slopes are dominantly 2 to 5 percent but are as much as 12 percent in places. A few areas are nearly level. In the group are—

Captina soils.
Dickson soils.
Sango soils.

The dense pan slows the movement of air and water through these soils and, during rainy periods, causes waterlogging in the lower part of the subsoil. Although the soils are suited to cultivated crops, the frequency of cultivation depends on the steepness of slopes. Nearly all the local crops can be grown, and they respond well to management.

WILDLIFE SUITABILITY GROUP 4

This group consists of clayey soils that developed from limestone on uplands. Slopes generally range between 2 and 30 percent, but there are a few steeper areas on short slopes along deeply cut drains. In addition, there are smooth, nearly level areas on hilltops. The soils have a thin, silty surface layer and a plastic clay subsoil. In most places the depth to bedrock is 2 to 6 feet. The soils are—

Christian soils.
Swaim soils.
Talbott soils.

Figure 24.—A typical area of Rock land.

These soils are hard to work. In places where the subsoil is exposed by erosion, the plow layer is sticky when wet and hard when dry. The available water capacity is moderate to low. Best suited to the soils are perennial plants and plants that grow vigorously in spring. Yields of summer annuals ordinarily are medium to low.

WILDLIFE SUITABILITY GROUP 5

Only Rock land is in this group. It consists of ledges of bedrock and shallow soil material in the cracks and crevices. Some areas are now in pasture, but most areas are forested or have a cover of bushes and weeds (fig. 24). The dominant slopes range from 15 to 45 percent.

WILDLIFE SUITABILITY GROUP 6

Cherty soils on hills and ridges are in this group. The gently sloping areas generally are small and are on ridgetops. The soils are droughty, especially on slopes facing south and west, and they are strongly acid and low in natural fertility. Their response to management is low. In the group are—

Baxter soils.
Bodine soils.

Best suited to these soils are perennial plants and plants that grow mostly in spring when moisture is plentiful. Yields of summer annuals ordinarily are medium to low. Only the small patches on ridgetops are suitable for frequent cultivation. A large acreage is in forest.

WILDLIFE SUITABILITY GROUP 7

The soils in this group are on bottom land and in depressions. They are silty to a depth of 30 inches or more and have a permeable subsoil. Most areas are poorly drained and are likely to be flooded for short periods in winter and spring. During those seasons the water table

generally is near the surface, but in summer and fall it may drop to a depth of 5 or 6 feet. In this group are—

Dunning soils.
Elkins soils.
Melvin soils.

Excess water narrows the choice of plants that can be grown on these soils, but it can be removed without much difficulty if outlets are available. Where drainage is improved, summer annuals produce satisfactory yields, for they do not require a long growing season. If these annuals are planted in areas of 3 acres or more and are flooded, they provide food for wild ducks.

WILDLIFE SUITABILITY GROUP 8

This group is made up of poorly drained, gray soils in nearly level or depressional areas. These soils have a silty, friable surface layer and a dense, slowly permeable subsoil. In winter and spring they commonly are wet and have water standing on the surface for short periods, but in summer they dry out and are droughty. These soils are moderately low in available water capacity, mainly because their root zone is shallow. In the group are—

Guthrie soils.
Lawrence soils.

These soils are low in natural fertility and are strongly acid, but they respond fairly well to management. Although they can be cultivated every year, they are suited only to water-tolerant plants unless drainage is improved. Areas of 3 acres or more are suitable for flooding and growing food for wild ducks.

WILDLIFE SUITABILITY GROUP 9

Ramsey soils—the only soils in this group—are shallow and sandy. They have a shallow root zone and low available water capacity. Most areas are wooded.

WILDLIFE SUITABILITY GROUP 10

This group consists of land types that are steep in most places and have many loose stones on the surface and throughout the profile. Some areas are deeply cut by gullies. In the group are—

Cobbly alluvial land.
Gullied land.
Stony colluvial land.

Gullied land is in small, scattered tracts on the Highland Rim. It is not suitable for cultivation, but it supports vines and pine trees. Stony colluvial land occupies a large acreage on the slopes of the Cumberland Mountains and is nearly all wooded. Many kinds of trees grow on Cobbly alluvial land and Stony colluvial land.

Formation, Classification, and Morphology of Soils

This section has four main parts. The first discusses the major factors of soil formation as they relate to the formation of soils in Warren County. In the second part the system for classifying soils is described and the soils are placed in the system. The third part discusses the morphology of soils, and the fourth describes the soil series of the county in detail.

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Formation of Soils

The characteristics of a soil at any given point are determined by the interaction of five factors of soil formation—climate, plants and other living organisms, parent material, relief, and time. Each of these factors affects the formation of every soil, and each modifies the effects of the other four. The importance of the individual factors varies from place to place.

Climate and vegetation are the active factors that change parent material and gradually form soil. Relief modifies the effects of climate and vegetation, mainly by its influence on runoff and temperature. The nature of the parent material also affects the kind of soil that is formed. Time is needed for changing the parent material into soil. Generally, a long period is required for distinct soil horizons to develop.

The interactions among these factors are more complex for some soils than for others. In many places, for example, the environment has changed and the characteristics of a new soil have been superimposed on those of an ancient one.

In the following pages the five major factors of soil formation are discussed in relation to their effects on the soils of Warren County.

Climate

The climate in the county is characterized by mild winters, warm summers, and abundant rainfall. Presumably, it is similar to the climate under which the soils formed. Climatic data for the county are given in the section "General Nature of the County."

The warm, moist climate promotes rapid soil development. The warm temperatures permit rapid chemical reactions. Large amounts of water are available to move through the soil and remove dissolved or suspended materials. The remains of plants decompose rapidly, and the organic acids thus produced hasten development of clay materials and removal of carbonates. Leaching and soil development can continue almost the year round because the soil is frozen for only short periods, and then to a depth of no more than 3 or 4 inches.

The climate is fairly uniform throughout the county, though it is slightly cooler and more moist on the Cumberland Plateau than in the other parts. Climate has had a strong influence on most soils in the county, but it alone does not account for local differences among the soils.

Living organisms

Plants, animals, insects, bacteria, and fungi are important in the formation of soils. Among the changes they cause are gains in organic matter and nitrogen in the soil, gains or losses in plant nutrients, and changes in structure and porosity.

Plants generally have a greater effect on soil formation than other living organisms have. In Warren County the native plants were dominantly hardwood trees. Chiefly oaks, hickory, beech, and yellow-poplar were on the well-drained sites. Sycamore, maple, and gum grew in the wet places. Because of the climate and the rapid decomposition of organic material from hardwoods, the soils generally are low in organic-matter content.

Parent material

Parent material is the unconsolidated mass from which a soil forms. It determines the limits of chemical and mineralogical composition for the soil. There is a wide variety of parent materials in Warren County—loess, alluvium, and residuum from several kinds of limestone and from sandstone and shale.

Nearly all of the western four-fifths of the county (the Highland Rim part) is underlain by limestone, some of which contains much chert. This limestone furnished the parent material for the Bodine, Baxter, and Christian soils, all of which are on strongly sloping hillsides of the Highland Rim. These soils have cherty and clayey profiles of low base saturation and low fertility.

Alluvium is the parent material for many soils in the county, especially those along the eastern edge of the Highland Rim and those bordering the larger streams. This alluvium probably came from the Cumberland Mountains. It washed down the mountain slopes and was deposited, 3 to 15 feet deep, on the Highland Rim. The alluvium was a mixture of materials weathered from limestone, sandstone, and shale. In most places it was later reworked by water. The soils that developed in it range from yellowish brown, such as the Jefferson soils, to dark red and red, such as the Cumberland and Waynesboro soils. All of these soils have a strongly developed clay loam to clay B horizon, low base saturation, and low to medium fertility.

Loess was the parent material of the soils on the smoother parts of the Highland Rim. A mantle of loess, 1 to 3 feet thick, was deposited on the entire Highland Rim during the glacial ages. Since that time the material has been washed off the steeper slopes, but a layer 1 to 3 feet thick remains in the smoother areas. Soils that developed in loess are light colored, silty, and low in fertility and base saturation. In many places a fragipan formed along the area of contact between the loess and the underlying red clay, which formed from limestone. The Mountview, Dickson, Lawrence, and Guthrie soils formed in loess, and the differences among them are due to differences in drainage.

The Cumberland Plateau and Mountains are underlain by sandstone that is interbedded with shale in some places. These rocks furnished the parent material for all the soils in this area—the Hartsells, Linker, and Ramsey soils. These soils have a loamy, light-colored subsoil and are very low in plant nutrients and in base saturation.

The soils on bottom land throughout the county formed in alluvium consisting of a mixture of material derived from the parent materials mentioned in this discussion.

Relief

Relief, or the shape of the landscape, affects soil formation through its influence on drainage, erosion, plant cover, and soil temperature. Slopes in Warren County range from nearly level to very steep.

The Guthrie, Lawrence, and other gray, poorly drained soils formed in nearly level and depressional areas where water stands or drains away slowly. In these places the soils are saturated for long periods and are poorly aerated, thus causing reduction and the formation of gray colors. In rolling areas that have good drainage, the soils generally are well aerated and have colors of red, yellow, or brown. On steep slopes in the Cumberland Mountains and similar areas, relief seems to be the dominant factor in soil formation. In these places the soil is removed by geologic and accelerated erosion nearly as fast as it forms. Consequently, a thick soil profile never develops. Examples of shallow soils on steep slopes are the Ramsey soils. The differences between the Ramsey soils and the associated Hartsells soils, which are 3½ to 6 feet deep, are caused by differences in relief.

Time

A long time generally is required for soil formation. The differences in length of time that parent materials have been in place therefore are commonly reflected in the character of the soil.

The soils in Warren County range from those that are very young and have little or no profile development to those that are very old and have a well-defined profile.

The Staser, Sequatchie, and Waynesboro soils are an example of a sequence of soils that owe their differences in characteristics to differences in time. The Staser soil is a young soil that lacks developed horizons because the materials have been in place only a short time. The Sequatchie soil lies a few feet higher than the Staser soil and has been in place long enough for weakly expressed horizons to develop. The B horizon in this soil has a slightly redder color and slightly more clay than the A horizon. Furthermore, the carbonates have leached out of this soil, and it is now strongly acid. The Waynesboro soil is an old, well-developed soil that has strongly contrasting horizons.

Classification of Soils

Soils are classified so that we may more easily remember their significant characteristics, assemble knowledge about them, see their relationships to one another and to the whole environment, and develop principles that help us understand their behavior and response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The system of classification used in this soil survey is that adopted as standard for all soil surveys in the United States, effective January 1, 1965 (*9*). It replaces the 1938 system, with revisions, of Baldwin, Kellogg, Thorp, and Smith (*2, 7*). In table 8 the soils of Warren County are classified according to the new and the old systems.

The current system of classification defines classes in terms of observable or measurable properties of soils. The properties chosen are primarily those that permit grouping soils that are similar in genesis. Genesis, or mode of soil origin, does not appear in the definitions of the classes; it lies behind the classes. The classification, designed to accommodate all soils, has six categories. Beginning with the most inclusive, the categories are the order, suborder, great group, subgroup, family, and series. Following are brief descriptions of the first five categories in the system. The series is defined in the section "How This Soil Survey Was Made."

TABLE 8.—*Soil series classified according to new and old systems of classification*

Series	New classification				1938 system of classification	
	Family [1]	Subgroup	Suborder	Order	Great soil group	Order
Allen	Fine loamy, siliceous, mesic.	Typic Normudults	Udults	Ultisols	Red-Yellow Podzolic	Zonal.
Baxter	Clayey, kaolinitic, thermic.	Typic Normudults	Udults	Ultisols	Red-Yellow Podzolic	Zonal.
Bodine	Loamy skeletal, siliceous, thermic.	Entic Normudults	Udults	Ultisols	Regosol	Azonal.
Bruno	Siliceous, thermic	Udipsamments [2]	Psamments	Entisols	Alluvial	Azonal.
Captina	Fine silty, siliceous, mesic.	Typic Fragiudults	Udults	Ultisols	Red-Yellow Podzolic	Zonal.
Christian	Clayey, kaolinitic, thermic.	Typic Normudults	Udults	Ultisols	Red-Yellow Podzolic	Zonal.
Cumberland	Clayey, kaolinitic, thermic.	Typic Rhodudults	Udults	Ultisols	Reddish-Brown Lateritic.	Zonal.
Dickson	Fine silty, siliceous, thermic.	Ochreptic Fragiudults	Udults	Ultisols	Red-Yellow Podzolic (grading toward Planosol).	Zonal.
Dunning	Fine, mixed, mesic	Typic Haplaquolls	Aquolls	Mollisols	Humic Gley	Intrazonal.
Elkins	Fine silty, siliceous, acid, mesic.	Typic Humaquepts	Aquepts	Inceptisols	Humic Gley	Intrazonal.
Etowah	Fine loamy, siliceous, thermic.	Humic Normudults	Udults	Ultisols	Red-Yellow Podzolic (grading toward Reddish-Brown Lateritic).	Zonal.
Guthrie	Fine silty, siliceous, thermic.	Typic Fragiaquults	Aquults	Ultisols	Planosol	Intrazonal.
Hartsells	Fine loamy, siliceous, mesic.	Typic Normudults	Udults	Ultisols	Red-Yellow Podzolic	Zonal.
Huntington	Fine silty, mixed, mesic.	Cumulic Hapludolls	Udolls	Mollisols	Alluvial	Azonal.
Jefferson	Fine loamy, siliceous, mesic.	Typic Normudults	Udults	Ultisols	Red-Yellow Podzolic	Zonal.
Lawrence	Fine silty, siliceous, mesic.	Aqueptic Fragiudults	Udults	Ultisols	Planosol	Intrazonal.
Lindside	Fine silty, mixed, nonacid, mesic.	Aquic Alentic Dystrochrepts.	Ochrepts	Inceptisols	Alluvial	Azonal.
Linker	Fine loamy, siliceous, mesic.	Typic Normudults	Udults	Ultisols	Red-Yellow Podzolic	Zonal.
Melvin	Fine silty, mixed, nonacid, thermic.	Alentic Normaquepts	Aquepts	Inceptisols	Low-Humic Gley	Intrazonal.
Minvale	Fine loamy, siliceous, thermic.	Typic Normudults	Udults	Ultisols	Red-Yellow Podzolic	Zonal.
Mountview	Fine silty, siliceous, thermic.	Typic Normudults	Udults	Ultisols	Red-Yellow Podzolic	Zonal.
Ramsey	Loamy skeletal, siliceous, mesic.	Lithic Dystrochrepts	Ochrepts	Inceptisols	Lithosol	Azonal.
Sango	Fine silty, siliceous, thermic.	Aqueptic Fragiudults	Udults	Ultisols	Red-Yellow Podzolic (grading toward Planosol).	Zonal.
Sequatchie	Coarse loamy,[3] siliceous, thermic.	Alfic Normudults [4]	Udults	Ultisols	Gray-Brown Podzolic (grading toward Alluvial).	Zonal.
Staser	Fine loamy, mixed, thermic.	Cumulic Hapludolls	Udolls	Mollisols	Alluvial	Azonal.
Swaim	Clayey, kaolinitic, thermic.	Typic Normudults	Udults	Ultisols	Red-Yellow Podzolic	Zonal.
Talbott	Clayey, kaolinitic, thermic.	Alfic Normudults	Udults	Ultisols	Red-Yellow Podzolic	Zonal.
Waynesboro	Clayey, kaolinitic, thermic.	Typic Normudults	Udults	Ultisols	Red-Yellow Podzolic (grading toward Reddish-Brown Lateritic).	Zonal.
Whitwell	Fine loamy, siliceous, thermic.	Paraquic Normudults	Udults	Ultisols	Gray-Brown Podzolic (grading toward Alluvial).	Zonal.

[1] Placement of the soil series into families by temperature reflects the present series classification. Some of the soils in Warren County are atypical of the soil series assigned in that they have warmer or cooler soil temperatures.

[2] Name is that of the great group. Bruno soils in this county have not been classified in a subgroup.

[3] The Sequatchie series as mapped in Warren County also contains soils of the fine loamy textural family.

[4] The Ap horizon of Sequatchie soils in this county is darker than the one defined for Alfic Normudults.

ORDER

Ten soil orders are recognized. The properties used to differentiate among soil orders are those that tend to give broad climatic groupings of soils. The two exeecptions to this are the Entisols and Histosols, which occur in many different climates. Each order is named with a word of three or four syllables ending in *sol* (Ent-i-sol).

As shown in table 8, there are four soil orders in Warren County: Entisols, Inceptisols, Mollisols, and Ultisols. Entisols are recent soils. They are without genetic horizons or have only the beginning of such horizons.

Inceptisols are soils that occur most commonly on young but not recent land surfaces. Their name is derived from the Latin *inception*, for beginning.

Mollisols are soils that have a dark-colored, thick surface layer and have high base saturation throughout the soil profile.

Ultisols are soils that are strongly weathered or strongly developed. Their name suggests the ultimate in soil development.

SUBORDER

Each order is subdivided into suborders that are based primarily on those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging, or soil differences resulting from the climate or vegetation. The names of suborders have two syllables. The last syllable indicates the order. An example is Aquepts (Aqu, meaning water or wet, and ept, from Inceptisol).

GREAT GROUP

Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated; those that have pans that interfere with growth of roots or movement of water, or both; and thick, dark-colored surface horizons. The features used are the self-mulching properties of clay, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), dark-red and dark-brown colors associated with basic rocks, and the like. The names of great groups have three or four syllables and are made by adding a prefix to the name of the suborder. An example is Normaquept (*Norm*, meaning normal, *aqu* for wetness or water, and *ept*, from Inceptisol).

SUBGROUP

Great groups are subdivided into subgroups, one representing the central (typic) segment of the group and others called intergrades that have properties of the group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Typic Normudult (a typical Normudult).

FAMILY

Families are separated within a subgroup primarily on the basis of properties important to the growth of plants or on the behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for texture, mineralogy, and so on, that are used as family differentiae (see table 8). An example is the fine silty, mixed, thermic family of Typic Normudults.

Morphology of Soils

This subsection gives brief definitions of terms used in naming soil horizons, and it discusses the processes responsible for the development of horizons.

The characteristics produced by soil-forming processes are recorded in the soil profile—a vertical section of the soil through all its horizons, or layers, to the underlying rock. The horizons differ in one or more properties, such as color, texture, structure, consistence, porosity, and reaction. A soil horizon may be thick or thin.

Most soil profiles contain three major horizons, called A, B, and C. The B horizon has not developed in the young soils.

The A horizon is the surface layer. It can be either the horizon of maximum organic matter, called the A1, or the horizon of maximum leaching of dissolved or suspended materials, called the A2.

The B horizon lies immediately beneath the A horizon and is called the subsoil. It is a horizon of maximum accumulation of dissolved or suspended materials, such as iron or clay. The B horizon normally is firmer than the horizons immediately above and below it and commonly has a blocky structure.

Beneath the B is the C horizon. This horizon is relatively little affected by the soil-forming processes, but it can be materially modified by weathering.

Several processes have been involved in the formation of soil horizons in the soils of Warren County. These processes are: (1) accumulation of organic matter, (2) leaching of calcium carbonates and bases, (3) reduction and transfer of iron, and (4) formation and translocation of silicate clay minerals. In most soils, more than one of these processes has been active in the development of horizons.

The accumulation of organic matter in the upper profile to form an A1 horizon has been an important process of horizon development. The soils of Warren County range from medium to very low in organic-matter content.

Leaching of carbonates and bases has occurred in nearly all the soils in the county. It is the generally accepted opinion among soil scientists that leaching of bases in soils generally precedes translocation of silicate clay materials. Most of the soils in the county are moderately to strongly leached, and this is an important factor in the development of horizons.

The reduction and transfer of iron, a process called gleying, is evident in the poorly drained soils of the county. The gray color in the subsoil horizons indicates the reduction and loss of iron. Some horizons contain reddish-brown mottles and concretions, an indication of segregation of iron.

In many soils of Warren County the translocation of clay minerals has contributed greatly to horizon develop-

ment. The eluviated A2 horizon, above the B horizon, has a granular structure, is lower in content of clay, and is lighter in color. The B horizon has an accumulation of clay and clay films in pores and on ped surfaces. These soils were probably leached of carbonates and soluble salts to a considerable extent before translocation of silicate clays took place. Leaching of bases and translocation of silicate clays are among the most important processes in horizon differentiation in the soils of Warren County.

Descriptions of Soil Profiles

In the following pages are detailed descriptions of the soil series of Warren County in alphabetical order. Given first are some pertinent facts about the series, then the profile descriptions, and finally the range of characteristics of the series as mapped in this county.

ALLEN SERIES.—The soils of the Allen series are Typic Normudults in a fine loamy, siliceous, mesic family. These deep, well-drained soils formed in old local alluvium on foot slopes and benches of the Cumberland Plateau escarpment.

The Allen soils are associated with the Jefferson and Etowah soils but are redder than the Jefferson soils and sandier than the Etowah soils.

Representative profile of Allen loam, 5 to 12 percent slopes, in an area along State Route 8, 1/4 mile west from base of Cumberland Plateau escarpment:

A1—0 to 1 inch, very dark grayish-brown (10YR 3/2) loam; weak, fine, granular structure; very friable; strongly acid; clear, smooth boundary.

A2—1 to 8 inches, brown (10YR 5/3) loam; weak, fine, granular structure; friable; strongly acid; gradual, smooth boundary.

B1—8 to 15 inches, strong-brown (7.5YR 5/6) loam; weak, fine, subangular blocky structure; friable; strongly acid; gradual, wavy boundary.

B21t—15 to 22 inches, yellowish-red (5YR 5/6 to 4/6) clay loam; moderate, medium, subangular blocky structure; friable; many clay films; strongly acid; gradual, smooth boundary.

B22t—22 to 40 inches, yellowish-red (5YR 4/6) or red (2.5YR 4/6) clay loam; moderate, medium, subangular blocky structure; friable; continuous clay films on some peds; strongly acid; gradual, wavy boundary.

B3t—40 to 60 inches, yellowish-red (5YR 4/6) or red (2.5YR 4/6) clay loam or clay with many, medium, distinct variegations of dark red, strong brown, and yellowish brown; strongly acid.

The texture of the A horizon is loam or cobbly loam. In places the A2 horizon is brown (10YR 4/3). The B22t horizon ranges from yellowish red or red to dark red (2.5YR 3/6).

BAXTER SERIES.—The soils of the Baxter series are Typic Normudults in a clayey, kaolinitic, thermic family. They developed in residuum weathered from cherty limestone and are deep, well drained, and cherty.

The Baxter soils are associated with the Bodine and Christian soils. They have a redder, more distinct B horizon than the Bodine soils. Baxter soils are not so cherty as the Christian soils. They are deeper to rock and have a thicker, redder B horizon than Christian soils, which formed from siltstone instead of cherty limestone.

Representative profile of Baxter cherty silt loam, 12 to 20 percent slopes, 2 miles north of McMinnville:

A1—0 to 1 inch, dark grayish-brown (10YR 4/2) cherty silt loam; weak, fine, granular structure; very friable; strongly acid; abrupt, smooth boundary.

A2—1 to 7 inches, brown (10YR 5/3) cherty silt loam; moderate, medium, granular structure; friable; strongly acid; gradual, smooth boundary.

B1t—7 to 12 inches, strong-brown (7.5YR 5/6) cherty silty clay loam; moderate, medium and fine, subangular blocky structure; friable; few clay films; strongly acid; gradual, smooth boundary.

B21t—12 to 24 inches, yellowish-red (5YR 4/8 or 5YR 5/8) cherty silty clay loam or cherty clay; strong, medium, angular and subangular blocky structure; firm; common clay films; strongly acid; gradual, smooth boundary.

B22t—24 to 35 inches, red (2.5YR 4/8) cherty clay with common, medium, distinct mottles of strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6); strong, medium, angular blocky structure; firm; common clay films; few, small, black concretions; strongly acid; gradual, wavy boundary.

B3t—35 to 50 inches, red (2.5YR 4/6 to 4/8) cherty clay with common, distinct mottles of yellowish red (5YR 5/8), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/6); moderate, medium and coarse, angular blocky structure; firm; common clay films; strongly acid; gradual, wavy boundary.

C—50 to 60 inches, very cherty clay mottled with red, yellowish red, strong brown, and yellowish brown; firm; very strongly acid.

The A horizon is cherty silt loam in most places, but it ranges to cherty loam. The B22t horizon ranges from cherty clay to cherty silty clay loam in texture and from red to yellowish red (5YR 5/6 to 5/8) in color. In some places the soil is cherty only in the upper 10 inches of the profile, and in these places the bedrock is partly siltstone.

BODINE SERIES.—The soils of the Bodine series are Entic Normudults in a loamy skeletal, siliceous, thermic family. They developed in residuum weathered from very cherty limestone, and are well drained or excessively drained and cherty.

The Bodine soils are associated with the Baxter soils but are more cherty and have less distinct horizons.

Representative profile of Bodine cherty silt loam, 20 to 45 percent slopes, about 2 miles west of Rock Island:

A1—0 to 1 inch, very dark grayish-brown (10YR 3/2) cherty silt loam; weak, fine, granular structure; very friable; strongly acid; abrupt, smooth boundary.

A2—1 to 8 inches, pale-brown (10YR 6/3) or brown (10YR 5/3) cherty silt loam; weak, fine, granular structure; friable; strongly acid; clear, wavy boundary.

BC—8 to 30 inches, brownish-yellow (10YR 6/6) or yellowish-brown (10YR 5/6 to 5/4) very cherty silt loam or very cherty silty clay loam; faintly variegated with yellowish red and gray; massive; friable; angular chert fragments make up about 50 percent of the soil mass by volume; this layer is underlain by a layer that has more chert and has brown silty soil material in the interstices.

The texture of the A2 horizon ranges from cherty silt loam to cherty loam. The chert content of the BC horizon ranges from 40 to 70 percent, by volume.

BRUNO SERIES.—Soils of the Bruno series are Udipsamments in a siliceous, thermic family. These sandy soils occur along the larger streams and are somewhat excessively or excessively drained. They formed in recent alluvium consisting of sediments washed from soils derived from limestone, sandstone, and shale.

The Bruno soils are associated with the Staser soils but are sandier and commonly are not so brown.

Representative profile of Bruno loamy sand in an area along Hickory Creek:

Ap—0 to 8 inches, pale-brown (10YR 6/3) loamy sand; structureless; loose; medium acid; gradual, smooth boundary.

C—8 to 45 inches, brown (10YR 5/3) loamy sand; structureless; loose; medium acid.

The Ap horizon ranges from pale brown to brown (10YR 6/3 and 4/3).

CAPTINA SERIES.—Soils of the Captina series are Typic Fragiudults in a fine silty, siliceous, mesic family. These silty soils occupy second bottoms and terraces, are moderately well drained, and have a fragipan. They developed in alluvium consisting of material that washed from soils derived from loess, limestone, sandstone, and shale.

The Captina soils are associated with the Whitwell and Sequatchie soils. Captina soils are similar to Dickson soils but have a darker colored surface layer and a slightly more clayey subsoil.

Representative profile of Captina silt loam, 1 to 3 percent slopes, 2 miles north of Morrison:

Ap—0 to 8 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; strongly acid; clear, smooth boundary.

B1—8 to 14 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, subangular blocky structure; friable; strongly acid; gradual, smooth boundary.

B21—14 to 24 inches, yellowish-brown (10YR 5/6) silty clay loam or silt loam with few medium mottles of grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) that are more common in the lower part; moderate, medium, subangular blocky structure; friable; few clay films; strongly acid; gradual, wavy boundary.

B22tx—24 to 32 inches, yellowish-brown (10YR 5/6) silty clay loam with many, medium, distinct mottles of light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6); massive macrostructure but moderate, medium, angular blocky microstructure; compact; firm; very strongly acid; common black concretions; gradual, smooth boundary.

B23tx—32 to 45 inches, mottled yellowish-brown (10YR 5/6), light brownish-gray (10YR 6/2) and dark yellowish-brown (10YR 4/4) silty clay loam; massive macrostructure but moderate, medium, angular blocky microstructure; compact; very strongly acid; black concretions are common; gradual, smooth boundary.

C—45 to 60 inches, mottled red (2.5YR 4/6), light brownish-gray (10YR 6/2), and yellowish-brown (10YR 5/6) silty clay loam; massive; firm; strongly acid; some black concretions.

The thickness of the alluvium ranges from 5 to 15 feet. In color the Ap horizon ranges to dark brown (10YR 3/3) or dark grayish brown (10YR 4/2). The B21 and B22tx horizons range to silt loam.

CHRISTIAN SERIES.—The soils of the Christian series are Typic Normudults in a clayey, kaolinitic, thermic family. They are well-drained, clayey soils that developed in residuum weathered from mixed siltstone and limestone.

The Christian soils are associated with the Baxter soils, but they are shallower to rock than those soils, have a thinner B horizon, and have less chert throughout the profile.

Representative profile of Christian silt loam, 5 to 12 percent slopes, eroded, in an area 1 mile south of Trousdale:

Ap—0 to 6 inches, brown (10YR 5/3) silt loam; moderate, medium, granular structure; friable; few fine chert fragments; strongly acid.

B1t—6 to 10 inches, yellowish-brown (10YR 5/6) or strong-brown (7.5YR 5/6) silty clay loam; moderate, fine, subangular blocky structure; friable; few fine chert fragments; strongly acid; clear, wavy boundary.

B2t—10 to 30 inches, yellowish-red (5YR 5/6) clay; strong, medium, subangular blocky structure; firm when moist, plastic when wet; common clay films; clear, wavy boundary.

B3t—30 to 40 inches, variegated red (2.5YR 4/6), strong-brown (7.5YR 5/6), and grayish-brown (10YR 5/2) clay; strong, medium, subangular blocky structure; common clay films; very firm when moist, plastic when wet; very strongly acid; gradual, wavy boundary.

C—40 to 60 inches, variegated red (2.5YR 4/8), yellowish-red (5YR 4/6), and pale-brown (10YR 6/3) clay or silty clay; very firm; common siltstone fragments; very strongly acid.

Color in the Ap horizon ranges from brown (10YR 5/3) to brown (10YR 4/3); and in the B2t horizon, from yellowish red (5YR 5/6) to red (2.5YR 4/6) and strong brown (7.5YR 5/6). The B1t horizon ranges from silty clay loam to clay. Chert makes up 0 to 10 percent of the soil, by volume. The depth to bedrock ranges from 3½ to 12 feet.

CUMBERLAND SERIES.—The soils of the Cumberland series are Typic Rhodudults in a clayey, kaolinitic, thermic family. These soils are deep, dark red, and well drained. They developed in alluvium that washed from uplands occupied by soils derived mainly from limestone but partly from shale and sandstone.

The Cumberland soils are associated with the Waynesboro soils, but they have a browner surface soil and a redder, finer textured subsoil.

Representative profile of Cumberland silt loam, 2 to 5 percent slopes, in an area about 3 miles south of Campaign:

Ap—0 to 8 inches, dark reddish-brown (5YR 3/3) silt loam; moderate, fine, granular structure; very friable; medium acid; gradual, smooth boundary.

B1t—8 to 14 inches, dark reddish-brown (2.5YR 3/4) silty clay loam or clay loam; moderate, medium, subangular blocky structure; friable; patchy clay films; a few black concretions 1 millimeter in diameter and a few quartzite pebbles; strongly acid; gradual, smooth boundary.

B21t—14 to 24 inches, dark-red (2.5YR 3/6) clay or clay loam; moderate, medium, subangular blocky structure; firm; continuous clay films; a few black concretions 1 to 2 millimeters in diameter; a few quartzite pebbles and fragments of chert; strongly acid; gradual, smooth boundary.

B22t—24 to 50 inches, dark-red (2.5YR 3/6 or 10YR 3/6) clay loam or clay; moderate, medium, angular and subangular blocky structure; firm; continuous clay films; a few black concretions 1 to 2 millimeters in diameter; a few quartzite pebbles and fragments of chert; very strongly acid; gradual, smooth boundary.

B3t—50 to 60 inches, dark-red (10YR 3/6) clay with streaks of yellowish brown (10YR 5/6); moderate, medium, angular blocky structure; firm; a few small, round, black concretions and a few chert fragments and round quartzite pebbles; very strongly acid.

The Ap horizon ranges to loam. The lower part of the B1t horizon ranges from dark reddish brown to dark red (2.5YR 3/6). In some places there are gravelly or cobbly layers in or below the B3t horizon. The thickness of the alluvium ranges from 3 to 15 feet.

DICKSON SERIES.—The soils of the Dickson series are Ochreptic Fragiudults in a fine silty, siliceous, thermic family. These silty soils are moderately well drained and have a fragipan. They formed in 2 to 3 feet of loess underlain by reddish, clayey material that is cherty or gravelly in places.

The Dickson soils are associated with the Mountview and Sango soils. They are not so well drained as the Mountview soils, which lack a fragipan. The Dickson soils are better drained and browner than the Sango soils.

Representative profile of Dickson silt loam, 1 to 4 percent slopes, in an area about 1 mile northeast of Centertown:

Ap—0 to 7 inches, brown (10YR 5/3) silt loam; weak, fine, granular structure; very friable, many roots; strongly acid; clear, smooth boundary.

B1—7 to 14 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, subangular blocky structure; friable; common roots; very strongly acid; gradual, smooth boundary.

B2—14 to 26 inches, yellowish-brown (10YR 5/6) coarse silty clay loam or silt loam; moderate to weak, fine and medium, subangular blocky structure; friable; common roots; very strongly acid; clear, wavy boundary.

A'2x & B'tx—26 to 40 inches, yellowish-brown (10YR 5/6) silt loam with thick coatings of dark brown (10YR 4/3) and many, medium, distinct mottles of gray (10YR 6/1) and pale brown (10YR 6/3); moderate, medium and coarse, angular blocky structure; compact and brittle; few clay films; common black concretions; few roots between peds; very strongly acid; gradual, irregular boundary.

IIB3t—40 to 60 inches+, variegated but mostly strong-brown (7.5YR 5/6) cherty silty clay loam to cherty clay with thick coatings of dark brown (7.5YR 4/4) and many, coarse, prominent mottles of yellowish brown (10YR 5/6) and yellowish red (5YR 4/6); moderate, medium, angular blocky structure; firm when moist, sticky and plastic when wet; common clay films; few small black concretions; tongues of yellowish-brown material from the horizon above extend into this layer; very strongly acid.

The Ap horizon ranges to brown (10YR 4/3) in some places. The depth to the fragipan ranges from 20 to 30 inches. In some places the IIB3t horizon is red clay loam or is red or yellowish-red silty clay loam, silty clay, or clay, and in some places it contains a large amount of chert or gravel.

DUNNING SERIES.—The soils of the Dunning series are Typic Haplaquolls in a fine, mixed, mesic family. These soils are black, fine textured, and very poorly drained. They are on first bottoms where they developed in fine-textured, nearly neutral alluvium.

The Dunning soils are associated with the Melvin and Lindside soils but are darker, finer textured, and more poorly drained than those soils.

Representative profile of Dunning silty clay loam in an area 1.2 miles northeast of Viola School:

A11—0 to 2 inches, dark-brown (10YR 3/3) silty clay loam with a few, fine, distinct mottles of strong brown (7.5YR 5/6); weak, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

A12—2 to 12 inches, black (10YR 2/1) silty clay loam; weak to moderate, medium, angular blocky or coarse, granular structure; firm; slightly acid; gradual, wavy boundary.

A13—12 to 22 inches, very dark gray (10YR 3/1) clay or silty clay with common, medium, prominent mottles of olive brown (2.5Y 4/4); massive; firm; slightly acid; gradual, wavy boundary.

C1g—22 to 38 inches, dark-gray (N 4/0) or gray (N 6/0) silty clay with common, medium, distinct mottles of olive brown (2.5Y 4/4) and yellowish brown (10YR 5/6); massive; firm; slightly acid; diffuse, wavy boundary.

C2g—38 to 60 inches, gray (N 5/0 or N 6/0) silty clay or clay with many, large, prominent mottles of light olive brown (2.5Y 5/6) and strong brown (7.5YR 5/8); massive; firm; slightly acid.

The A11 horizon is overwash material and is not present in all areas. In some places the upper 8 inches of the A12 horizon is nearly silt loam in texture and ranges from black to very dark gray (10YR 3/1) in color. In thickness the A horizon ranges from 10 to 24 inches but commonly is 10 to 20 inches. The A horizon is very dark gray or black. The C horizon is dominantly gray, dark gray, or light brownish gray.

ELKINS SERIES.—The soils of the Elkins series are Typic Humaquepts in a fine silty, siliceous, acid, mesic family. These dark, poorly drained, silty soils are in medium to large depressions. They formed in acid alluvium that washed from soils derived from limestone, siltstone, and loess.

The Elkins soils are associated with the Guthrie and Lawrence soils but are darker colored and more poorly drained than those soils and do not have a fragipan. The Elkins soils resemble the Dunning soils but are more strongly acid and are siltier throughout the profile.

Representative profile of Elkins silt loam in an area about 3 miles north of Centertown:

A11—0 to 12 inches, black to very dark gray (10YR 2/1 to 3/1) silt loam; moderate, fine, granular structure; very friable; strongly acid; gradual, smooth boundary.

A12—12 to 18 inches, very dark gray (10YR 3/1) silt loam; weak, medium, granular structure; friable; strongly acid; gradual, smooth boundary.

C1g—18 to 24 inches, dark-gray (10YR 4/1) silt loam with a few, common, distinct mottles of light olive brown (2.5Y 5/4); very strongly acid; gradual, smooth boundary.

C2g—24 to 36 inches, dark-gray (10YR 4/1) to gray (10YR 5/1) heavy silt loam with a few, distinct, light olive-brown (2.5Y 5/4) mottles; very strongly acid.

The A11 and A12 horizons range from 10 to 20 inches in total thickness and from black to very dark gray in color. The C1g horizon may be gray (10YR 5/1) or light brownish gray (10YR 6/2). The C2g horizon may be silt loam or silty clay loam. Reaction throughout the profile is strongly acid or very strongly acid.

ETOWAH SERIES.—Soils of the Etowah series are Humic Normudults in a fine loamy, siliceous, thermic family. These soils are deep and well drained. They developed in alluvium that washed from uplands dominated by limestone.

The Etowah soils are associated with the Cumberland and Waynesboro soils. They are less red in the B horizon than the Waynesboro soils and contain less sand throughout. The Etowah soils are neither so red nor so clayey as the Cumberland soils.

Representative profile of Etowah silt loam, 2 to 5 percent slopes, in an area about one-half mile south of Irving College:

Ap—0 to 8 inches, dark-brown (7.5YR 3/2) silt loam; weak, fine, granular structure; very friable; medium acid; clear, smooth boundary.

B1—8 to 14 inches, reddish-brown (5YR 4/4) silty clay loam; weak, fine to medium, subangular blocky structure; friable; a few black concretions; strongly acid; gradual, wavy boundary.

B2t—14 to 42 inches, yellowish-red (5YR 4/6 to 4/8) silty clay loam; moderate, medium, subangular blocky structure; friable; a few small black concretions; discontinuous clay films; strongly acid; gradual, wavy boundary.

B3t—42 to 55 inches, yellowish-red (5YR 5/6) silty clay loam; weak, medium, subangular blocky structure; firm; black concretions; clay films are on most ped faces; strongly acid.

The Ap horizon is dominantly silt loam but is loam in some places and ranges to 10YR 3/3 in color. The B horizon is yellowish-red silty clay loam in most places, but

it ranges to reddish-brown or red clay loam. Streaks of yellowish brown are common below a depth of 3 feet.

GUTHRIE SERIES.—The soils of the Guthrie series are Typic Fragiaquults in a fine silty, siliceous, thermic family. These soils are gray and poorly drained and have a fragipan. They formed in 2 to 4 feet of loess underlain by old alluvium or by residuum derived from limestone or siltstone.

The Guthrie soils are associated with the Lawrence and Sango soils but are grayer and more poorly drained than those soils.

Representative profile of Guthrie silt loam in an area about one-fourth mile southwest of Morrison:

A1—0 to ½ inch, very dark gray (10YR 3/1) silt loam; weak, fine, granular structure; very friable; strongly acid; many roots; abrupt, smooth boundary.

A21g—½ inch to 7 inches, gray (10YR 5/1) to dark-gray (10YR 4/1) silt loam with common, fine, distinct mottles of dark yellowish brown (10YR 4/4); weak, fine, granular structure; friable; few roots; strongly acid; gradual, wavy boundary.

A22g—7 to 10 inches, gray (10YR 5/1) silt loam with common, fine, faint mottles of grayish brown (2.5Y 5/2) and a few, fine, distinct mottles of yellowish brown (10YR 5/6); weak, fine and medium, angular blocky structure; friable; few roots; strongly acid; gradual, wavy boundary.

B2g—10 to 24 inches, grayish-brown (2.5Y 5/2) silt loam with common, medium, distinct mottles of light olive brown (2.5Y 5/6) and olive brown (2.5Y 4/4); moderate, medium, subangular blocky structure; gray (10YR 5/1) clay in many pores and thin clay films on ped surfaces; friable; very strongly acid; clear, wavy boundary.

B31tgx—24 to 36 inches, grayish-brown (2.5Y 5/2) fine silt loam with common, medium, distinct mottles of yellowish brown (10YR 5/6) and light gray (10YR 6/1); massive (structureless); compact; thick clay films in pores; very strongly acid; gradual, smooth boundary.

B32tgx—36 to 56 inches, gray (N 5/0 to N 6/0) silty clay loam with many, coarse, prominent mottles of strong-brown (7.5YR 5/6) silt loam; streaks of light gray (N 7/0) in a few pores; massive (structureless); compact and brittle; very strongly acid.

In cultivated areas the A1 horizon is lacking and the plow layer commonly is grayish brown (10 YR 5/2). The depth to the fragipan ranges from 18 to 32 inches. Below the fragipan is a buried soil that is mottled yellowish red, yellowish brown, and gray and that formed in residuum from limestone in some places and in alluvium in others. The buried soil is clay loam, silty clay loam, silty clay, or clay and is cherty or gravelly in some places.

HARTSELLS SERIES.—The soils of the Hartsells series are Typic Normudults in a fine loamy, siliceous, mesic family. They are well-drained, moderately deep soils that formed in material weathered from acid sandstone (fig. 25).

The Hartsells soils are associated with the Linker and Ramsey soils. They are yellower and generally not so deep as the Linker soils, and they are deeper and have more strongly developed horizons than the Ramsey soils.

Representative profile of Hartsells loam, 2 to 5 percent slopes, near a fire tower in an area along State Route 8 on the Cumberland Plateau:

A1—0 to 1 inch, very dark grayish-brown (10YR 3/2) loam; weak, fine, granular structure; very friable; strongly acid; abrupt, smooth boundary.

A2—1 inch to 7 inches, brown (10YR 5/3 to 4/3) loam; moderate, fine, granular structure; friable; very strongly acid; clear, smooth boundary.

***Figure 25.*—The Hartsells soils formed in material weathered from sandstone, similar to this Sewanee sandstone exposed on a bluff of the Cumberland Plateau.**

B1—7 to 15 inches, yellowish-brown (10YR 5/6) clay loam or loam; weak, fine, subangular blocky structure; friable; very strongly acid; gradual, wavy boundary.

B2—15 to 34 inches, yellowish-brown (10YR 5/6) clay loam or loam; weak, fine, subangular blocky structure; friable; a few clay films; very strongly acid; gradual, wavy boundary.

B3—34 to 38 inches, yellowish-brown (10YR 5/8) clay loam, loam, or sandy clay loam; weak, medium, subangular blocky structure; friable; a few sandstone fragments; very strongly acid; gradual, wavy boundary.

C—38 to 44 inches, mottled yellowish-red (5YR 4/8) and yellowish-brown (10YR 5/6) sandy clay loam to sandy loam; moderate, medium, subangular and angular blocky structure; friable; few sandstone fragments; very strongly acid.

R—44 inches +, sandstone bedrock.

In this county the A horizon is loam or silt loam. The A2 horizon, or the Ap horizon in cultivated areas, is dark grayish brown (10YR 4/2) in some places. Bedrock occurs at a depth of 2½ to 6 feet.

HUNTINGTON SERIES.—Soils of the Huntington series are Cumulic Hapludolls in a fine silty, mixed, mesic family. These soils are deep, friable, and well drained. They occur on nearly level or gently sloping flood plains, or first bottoms, in narrow strips along small drainageways, and at the base of slopes. Some areas are in depressions.

The Huntington soils are associated with the Lindside soils but are better drained.

Representative profile of Huntington silt loam in an area along Hills Creek:

Ap—0 to 8 inches, dark-brown (10YR 3/3) silt loam; weak, fine, granular structure; very friable; slightly acid or medium acid; gradual, smooth boundary.

C1—8 to 20 inches, very dark grayish-brown (10YR 3/2) to dark-brown (10YR 3/3) silt loam; weak, fine, granular structure; friable; slightly acid or medium acid; diffuse, wavy boundary.

C2—20 to 48 inches, dark-brown (10YR 4/3) or dark yellowish-brown (10YR 4/4) silt loam; weak, fine, granular structure; friable; slightly acid or medium acid.

The Ap and the C1 horizons are dominantly dark brown (10YR 3/3), but they are brown (10YR 4/3) in some places. In many places the texture of all horizons is loam instead of silt loam.

JEFFERSON SERIES.—The soils of the Jefferson series are Typic Normudults in a fine loamy, siliceous, mesic family. These deep, well-drained loamy soils formed in alluvium that washed from uplands where the dominant rock is sandstone.

The Jefferson soils are associated mainly with the Waynesboro and Allen soils. In the Jefferson soils, however, the B horizon is yellowish, whereas it is red in the Waynesboro and Allen soils.

Representative profile of Jefferson loam, 2 to 5 percent slopes, in an area about 2 miles northwest of Campaign:

A1—0 to 1 inch, dark grayish-brown (10YR 4/2) loam; weak, fine, granular structure; very friable; strongly acid; abrupt, smooth boundary.
A2—1 to 9 inches, brown (10YR 5/3) loam; weak, fine, granular structure; very friable; very strongly acid; clear, wavy boundary.
B1—9 to 13 inches, yellowish-brown (10YR 5/4) loam; weak, fine, subangular blocky structure; friable; very strongly acid; gradual, wavy boundary.
B21—13 to 20 inches, yellowish-brown (10YR 5/6) loam; moderate, medium, subangular blocky structure; friable; very strongly acid.
B22t –20 to 45 inches; yellowish-brown (10YR 5/6) clay loam or loam; moderate, medium, subangular blocky structure; few clay films; friable; very strongly acid; gradual, wavy boundary.
C—45 to 60 inches, yellowish-brown (10YR 5/6) clay loam with common, fine, distinct mottles of strong brown (7.5YR 5/6) and pale brown (10YR 6/3); massive (structureless); firm; very strongly acid.

In cultivated areas the A1 horizon is absent, and the Ap layer ranges from 6 to 10 inches in thickness. The A2 horizon ranges from brown (10YR 4/3) to pale brown (10YR 6/3).

LAWRENCE SERIES.—The soils of the Lawrence series are Aqueptic Fragiudults in a fine silty, siliceous, mesic family. These silty soils are somewhat poorly drained and have a fragipan. They formed in 2 to 4 feet of loess underlain by clayey residuum from limestone or by old alluvium.

The Lawrence soils are associated with the Dickson, Sango, and Guthrie soils. They are better drained and less gray than the Guthrie soils, but they are more poorly drained and shallower to mottling than the Dickson and Sango soils.

Representative profile of Lawrence silt loam in an area 1 mile east of Morrison:

A1—0 to 1 inch, gray (10YR 5/1) silt loam; weak, fine, granular structure; very friable; medium acid; abrupt, smooth boundary.
A2—1 to 7 inches, grayish-brown (10YR 5/2) silt loam; weak, fine, granular structure; very friable; very strongly acid; clear, wavy boundary.
B1—7 to 12 inches, mottled light brownish-gray (10YR 6/2) and light yellowish-brown (10YR 6/4) silt loam; weak, fine and medium, subangular blocky structure; friable; very strongly acid; gradual, wavy boundary.
B2g—12 to 26 inches, light brownish-gray (2.5Y 6/2) silt loam with common, medium, distinct mottles of light yellowish brown (2.5Y 6/4) and yellowish brown (10YR 5/6); moderate, medium, subangular blocky structure; friable; very strongly acid; clear, wavy boundary.
A'2 & B'21x—26 to 38 inches, mottled gray (10 YR 6/1) and yellowish-brown (10YR 5/6) silt loam with a few, fine, distinct mottles of strong brown (7.5YR 5/6); moderate, medium and coarse, subangular blocky structure; compact and brittle; hard when dry; very strongly acid; clear, wavy boundary.
B'22tx—38 to 46 inches, mottled gray (10YR 6/1), strong-brown (7.5YR 5/6), and yellowish-brown (10YR 5/6) silty clay loam; moderate, medium and coarse, angular blocky structure; compact and brittle; common hard concretions; very strongly acid.

Nearly all of this soil is in slight depressions. The parent material is loess, but in some places at least a part of the loess was probably washed in from nearby slopes. The texture of the Bx1 horizon ranges from silt loam to silty clay loam. The fragipan ranges from weak to strong in development and commonly occurs at a depth of 20 to 25 inches. The fragipan is discontinuous; in places it has not formed or has been punctured by burrowing animals or by the uprooting of trees.

LINDSIDE SERIES.—The soils of the Lindside series are Aquic Alentic Dystrochrepts in a fine silty, mixed, nonacid, mesic family. They are moderately well drained and somewhat poorly drained soils on first bottoms and in depressions. They formed in alluvium that recently washed from uplands dominated by limestone.

The Lindside soils are associated with the poorly drained Melvin soils and the well-drained Huntington soils.

Representative profile of Lindside silt loam in an area 0.2 mile southeast of Viola:

Ap—0 to 7 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable; slightly acid or medium acid; gradual, wavy boundary.
C1—7 to 15 inches, dark-brown (10YR 3/3) or brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; slightly acid or medium acid; gradual, wavy boundary.
C2—15 to 30 inches, dark grayish-brown (10YR 4/2) silt loam with common, medium, distinct mottles of strong brown (7.5YR 5/6) and light brownish gray (10YR 6/2); weak, medium, granular structure; slightly acid or medium acid; gradual, wavy boundary.
C3 -30 to 48 inches, dark-gray (10YR 4/1) silt loam or silty clay loam with many, medium, distinct mottles of yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2); massive (structureless); friable; slightly acid or medium acid.

The color of the Ap horizon ranges from brown to dark grayish brown (10YR 4/2). The depth to gray mottles ranges from 12 to 20 inches.

LINKER SERIES.—The soils of the Linker series are Typic Normudults in a fine loamy, siliceous, mesic family. These well-drained, loamy soils are on uplands of the Cumberland Plateau. They formed in residuum weathered from acid sandstone.

The Linker soils are associated with the Hartsells and Ramsey soils. They have a redder B horizon than the Hartsells soils and are slightly more clayey in the subsoil. The Linker soils are deeper to bedrock than the Ramsey soils and have more distinct horizons.

Representative profile of Linker loam, 2 to 5 percent slopes, in an area on the Cumberland Plateau, 7 miles southeast of McMinnville along State Route 8:

A1—0 to 1 inch, dark-brown (10YR 3/3) loam; weak, fine, granular structure; very friable.
A2—1 to 6 inches, brown (10YR 5/3) loam; weak, fine to medium, granular structure; very friable; very strongly acid; gradual, smooth boundary.
B1—6 to 10 inches, yellowish-red (5YR 5/6) loam; weak, fine, subangular blocky structure; friable; a few patchy clay films; very strongly acid; gradual, smooth boundary.
B21t—10 to 22 inches, yellowish-red (5YR 4/8) clay loam; weak, fine, angular blocky structure; friable; few clay films; very strongly acid; gradual, smooth boundary.
B22t—22 to 32 inches, red (2.5YR 4/6) or yellowish-red (5YR 4/6) clay loam with a few, medium, distinct mottles of strong brown (7.5YR 5/8); friable; a few clay films; strongly acid; gradual, smooth boundary.

B31t—32 to 40 inches, red (2.5YR 4/8) clay loam with common, medium, distinct mottles of yellowish brown (10YR 5/6); friable; a few clay films; strongly acid; gradual, irregular boundary.

B32—40 to 60 inches, red (2.5YR 4/6) or dark-red (2.5YR 3/6) sandy clay loam or clay loam; moderate, fine, angular blocky structure; friable; very strongly acid.

Some profiles have a yellowish-brown (10YR 5/6 to 5/8) A3 horizon about 4 inches thick. The B1 horizon is strong brown (7.5YR 5/6) in some places.

Melvin Series.—The soils of the Melvin series are Alentic Normaquepts in a fine silty, mixed, nonacid, thermic family. These are poorly drained soils on first bottoms. They formed in recent alluvium that washed from uplands and terraces where the soils formed mostly in residuum weathered from limestone.

The Melvin soils are associated with the Lindside soils, but they are grayer than those soils and are more distinctly mottled in the upper layers.

Representative profile of Melvin silt loam in an area 2 miles south of Viola:

Ap—0 to 8 inches, grayish-brown (10YR 5/2) silt loam with a few, fine, distinct mottles of strong brown (7.5YR 5/6); weak, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

C1g—8 to 20 inches, gray (10YR 5/1) silt loam with common, fine, distinct mottles of yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6); weak, fine, granular structure; friable; a few small black concretions; slightly acid; gradual, smooth boundary.

C2g—20 to 48 inches +, gray (10YR 5/1 to 6/1) silt loam or silty clay loam with common, medium, distinct mottles of strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4); massive (structureless); friable; a few small black concretions; slightly acid.

In some places the Ap horizon is dark grayish brown (10YR 4/2) and the C horizon is dark gray (10YR 4/1). The reaction is medium acid or slightly acid.

Minvale Series.—Soils of the Minvale series are Typic Normudults in a fine loamy, siliceous, thermic family. These soils are on foot slopes, benches, and fans below upland slopes, and they are deep and well drained. They formed in old local alluvium that washed from uplands occupied by soils derived from limestone.

The Minvale soils are associated with the Etowah soils but have a lighter brown surface layer.

Representative profile of Minvale silt loam, 2 to 5 percent slopes, in an area about 2 miles southwest of Irving College:

Ap—0 to 8 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable; strongly acid; clear, smooth boundary.

B1—8 to 12 inches, strong-brown (7.5YR 5/6) silt loam; weak, fine, granular structure; friable; strongly acid; gradual, wavy boundary.

B2t—12 to 36 inches, yellowish-red (5YR 4/6 to 5/6) silty clay loam; moderate, medium, subangular blocky structure; friable; a few clay films; strongly acid; gradual, wavy boundary.

B3t—36 to 54 inches, yellowish-red (5YR 5/6) silty clay loam with common, medium, distinct variegations of yellowish brown and grayish brown; moderate, medium, blocky structure; firm; a few clay films; strongly acid.

The Ap horizon ranges from 6 to 9 inches in thickness. In some places the B2t and B3t horizons are strong brown (7.5YR 5/6).

Mountview Series.—The soils of the Mountview series are Typic Normudults in a fine silty, siliceous, thermic family. These well-drained, silty soils are on gently rolling uplands of the Highland Rim. They formed in 2 or 3 feet of loess underlain by several feet of clay that weathered from limestone.

The Mountview soils are associated with the Dickson, Baxter, and Christian soils. They are better drained than the Dickson soils, which have a fragipan.

Representative profile of Mountview silt loam, 2 to 5 percent slopes, in an area about 1 mile north of Shady Rest, also called Marlin Charge:

Ap—0 to 10 inches, brown (10YR 5/3) silt loam; weak, fine, granular structure; very friable; very strongly acid; gradual, smooth boundary.

B1—10 to 15 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, subangular blocky structure; friable; very strongly acid; gradual, smooth boundary.

B2t—15 to 30 inches, yellowish-brown (10YR 5/8) to strong-brown (7.5YR 5/6) silt loam or silty clay loam; moderate, medium, subangular blocky structure; friable; a few clay films; a few small chert fragments; very strongly acid; clear, wavy boundary.

IIB22t—30 to 42 inches, strong-brown (7.5YR 5/6) heavy silty clay loam with common, medium, distinct mottles of yellowish red and grayish brown; strong, medium, angular blocky structure; very firm when moist, sticky to slightly plastic when wet; many clay films; common chert fragments; very strongly acid; gradual, wavy boundary.

IIB3t—42 to 60 inches, mottled yellowish-red, yellowish-brown, strong-brown, and grayish-brown cherty clay; strong, fine and medium, angular blocky structure; very firm when moist, sticky and plastic when wet; very strongly acid; 5 to 30 feet thick over cherty limestone.

The Ap horizon generally ranges from 6 to 10 inches in thickness, but in a few spots it is only 4 or 5 inches thick. In some places the Ap horizon is brown (10 YR 4/3). The B2t horizon is dominantly silt loam but in some areas is silty clay loam. Some areas have a few chert fragments throughout the profile.

Ramsey Series.—The soils of the Ramsey series are Lithic Dystrochrepts in a loamy skeletal, siliceous, mesic family. These soils are shallow and excessively drained, and they have faint horizons. They formed in material weathered from acid sandstone on steep slopes in the Cumberland Mountains (fig. 26).

Figure 26.—**Profile of a Ramsey soil on the Cumberland Plateau.**

The Ramsey soils are associated with the Hartsells and Linker soils, but they have less distinct horizons and are shallower to bedrock.

Representative profile of Ramsey loam, 12 to 20 percent slopes, in an area about 7 miles southeast of McMinnville on the Cumberland Plateau:

A1—0 to 1 inch, very dark grayish-brown (10YR 3/2) loam; weak, fine, granular structure; very friable; strongly acid; clear boundary.

A2—1 to 7 inches, brown (10YR 5/3) to dark grayish-brown (10YR 4/2) loam; weak, fine, granular structure; very friable; very strongly acid; gradual, smooth boundary.

BC—7 to 14 inches, yellowish-brown (10YR 5/6) to light yellowish-brown (10YR 6/4) loam or sandy loam; weak, fine, subangular blocky structure; friable; common loose fragments of sandstone; very strongly acid.

C—14 to 20 inches, weathered fragments of sandstone with yellowish-brown to reddish-yellow, loamy soil material between the sandstone layers and fragments; very strongly acid.

R—20 inches, sandstone bedrock.

In some places the A2 horizon is sandy loam. The depth to sandstone bedrock ranges from 12 to 24 inches.

Sango Series.—The soils of the Sango series are Aqueptic Fragiudults in a fine silty, siliceous, thermic family. These silty soils are moderately well drained and have a fragipan. They formed in 2 or 3 feet of loess underlain by cherty residuum that weathered from limestone.

The Sango soils are associated with the Dickson, Lawrence, and Guthrie soils. They are lighter colored than the Dickson soils and are not so well drained. The Sango soils are better drained than the Lawrence and Guthrie soils.

Representative profile of Sango silt loam in an area one-fourth mile north of Morrison:

Ap—0 to 5 inches, brown (10YR 5/3) or pale-brown (10YR 6/3) silt loam; weak, medium, granular structure; friable; very strongly acid; gradual, smooth boundary.

B1—5 to 10 inches, light olive-brown (2.5Y 5/4) silt loam; weak, fine and medium, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.

B2—10 to 20 inches, light yellowish-brown (2.5Y 6/4) to light olive-brown (2.5Y 5/4) silt loam with a few, fine, faint mottles of brown and grayish brown in lower part; weak, medium, subangular blocky structure; friable; a few small, round, dark-brown concretions; very strongly acid; clear, smooth boundary.

Bx—20 to 35 inches, mottled grayish-brown (2.5Y 5/2), yellowish-brown (10YR 5/6), gray (10YR 5/1), and strong-brown (7.5YR 5/6) silt loam; moderate, medium, angular blocky structure; firm; compact; a few small, round, dark-brown concretions; very strongly acid; clear, irregular boundary.

IIBt—35 to 70 inches +, mottled strong-brown (7.5YR 5/6), yellowish-brown (10YR 5/6), yellowish-red (5YR 5/8), and red (2.5YR 4/6), firm silty clay loam or cherty silty clay loam; massive (structureless) in place, but breaks to strong, angular blocky and platy structure; very strongly acid.

The fragipan ranges from 18 to 30 inches in depth and from 8 to 20 inches in thickness.

Sequatchie Series.—The soils of the Sequatchie series are Alfic Normudults, but in this county their Ap horizon is darker than that defined for Alfic Normudults. They normally are in a coarse loamy, siliceous, thermic family, though the series as mapped in Warren County also contains soils of the fine loamy textural family. Sequatchie soils occupy low stream terraces and are well drained. They formed in alluvium that washed mainly from soils underlain by sandstone, shale, and limestone.

The Sequatchie soils are associated with the Whitwell soils but are browner and better drained.

Representative profile of Sequatchie loam, 2 to 5 percent slopes, on a low terrace along Hills Creek:

Ap—0 to 8 inches, dark-brown (10YR 3/3) loam; weak, medium, granular structure; very friable; medium acid; gradual, smooth boundary.

B1—8 to 12 inches, strong-brown (7.5YR 5/6) loam; weak, fine, subangular blocky structure; friable; medium acid; gradual, smooth boundary.

B2t—12 to 30 inches, dark-brown (7.5YR 4/4) or reddish-brown (5YR 4/4) clay loam or loam; weak, fine, subangular blocky structure; friable; few clay films; medium acid; gradual, smooth boundary.

B3t—30 to 40 inches, strong-brown (7.5YR 5/6) sandy clay loam; weak, fine, subangular blocky structure; friable; medium acid; clear, smooth boundary.

C—40 to 60 inches +, brown to dark-brown (10YR 5/3 to 4/3), sandy clay loam faintly mottled with grayish brown (2.5Y 5/2) and pale brown (10YR 6/3); structureless; common small, water-rounded pebbles and cobbles as much as 8 inches across; strongly acid.

In places the Ap horizon is silt loam. In some places the B2t horizon is silty clay loam. The C horizon may be sandy loam or loam, and it may or may not contain pebbles and cobbles.

Staser Series.—The soils of the Staser series are Cumulic Hapludolls in a fine loamy, mixed, thermic family. These loamy soils are on deep, well-drained first bottoms and are medium acid or slightly acid.

Representative profile of Staser sandy loam, 0 to 2 percent slopes, in an area 3 miles south of McMinnville:

Ap—0 to 9 inches, dark-brown (10YR 3/3) sandy loam; weak, fine, granular structure; very friable; slightly acid; gradual, smooth boundary.

C1—9 to 30 inches, dark-brown (10YR 4/3) sandy loam; weak, fine, granular structure; very friable; medium acid or slightly acid; gradual, smooth boundary.

C2—30 to 50 inches, brown (10YR 4/3) sandy loam with a few, fine, dark grayish-brown (10YR 4/2) mottles; weak, fine, granular structure; very friable; slightly acid.

The C1 horizon ranges from 10 to 24 inches in thickness. The C1 and C2 horizons are sandy loam in most places, but they range to fine sandy loam or loam. Some profiles consist of alternate layers of sandy loam and loam. The soil is medium acid or slightly acid.

Swaim Series.—The soils of the Swaim series are Typic Normudults in a clayey, kaolinitic, thermic family. These clayey soils occur on foot slopes and benches and are well drained or moderately well drained. They formed in colluvial deposits washed largely from the Talbott soils.

Representative profile of Swaim silt loam, 3 to 10 percent slopes, eroded, in an area about 1½ miles south of bridge across the Collins River and near State Route 8:

Ap—0 to 6 inches, brown (10YR 4/3) silt loam; moderate, fine, granular structure; friable; strongly acid; gradual, smooth boundary.

B21t—6 to 14 inches, yellowish-brown (10YR 5/6) and brown (10YR 4/3) silty clay loam; moderate, fine subangular blocky structure; friable; a few clay films; strongly acid; gradual, smooth boundary.

B22t—14 to 24 inches, yellowish-brown (10YR 5/6) silty clay or clay with a few, fine, distinct mottles of yellowish red (5YR 4/6); strong, medium, subangular blocky structure; firm; continuous clay films; strongly acid; gradual, wavy boundary.

B3t—24 to 40 inches +, yellowish-brown (10YR 5/6) clay with common, fine to medium, distinct mottles of yellowish red (5YR 4/6), strong brown (7.5YR 5/6), and light brownish gray (10YR 6/2); massive; firm; strongly acid; the proportion of gray increases with depth.

Pieces of chert are common in some areas, especially in the eroded spots. The B horizon ranges from yellowish brown to yellowish red, but in most places it is mottled with those colors. In some places the B21t horizon is clay or silty clay.

Talbott Series.—The soils of the Talbott series are Alfic Normudults in a clayey, kaolinitic, thermic family. These clayey soils are on well-drained uplands and developed in residuum from limestone. Limestone crops out in many places.

The Talbott soils are associated with the Swaim soils, which developed in local alluvium instead of residuum.

Representative profile of Talbott silt loam, 5 to 12 percent slopes, about 1 mile west of the Van Buren County line along State Route 30.

A1—0 to 1 inch, very dark brown (10YR 2/2) silt loam and organic matter; weak, fine, granular structure; friable; strongly acid; abrupt, smooth boundary.

A2–1 to 6 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; strongly acid; clear, smooth boundary.

B21t—6 to 24 inches, yellowish-red (5YR 4/8) silty clay or clay; moderate, medium, angular blocky structure; very firm; common clay films; plastic when wet; strongly acid; gradual, wavy boundary.

B22t—24 to 32 inches, variegated yellowish-red (5YR 4/8), strong-brown (7.5YR 5/8), and pale-brown (10YR 6/3) clay; moderate, medium, angular blocky structure; very firm; common clay films; strongly acid.

B3t—32 to 42 inches, variegated yellowish-red (5YR 5/8), yellow (2.5Y 7/6), and strong-brown (7.5YR 5/6) clay; very firm; plastic when wet; medium acid.

The profile generally is strongly acid but commonly is medium acid in the lower part.

Waynesboro Series.—The soils of the Waynesboro series are Typic Normudults in a clayey, kaolinitic, thermic family. These soils occur on high terraces and are deep and well drained. They formed in alluvium (fig. 27) washed mainly from soils derived from acid sandstone, shale, and limestone.

The Waynesboro soils are associated with the Jefferson and Cumberland soils. They have a redder B horizon than the Jefferson soils. They are slightly coarser textured than the Cumberland soils and are not so red.

Representative profile of Waynesboro loam, 2 to 5 percent slopes, in an area about 2 miles south of McMinnville:

Ap—0 to 7 inches, brown (10YR 4/3) loam; weak, fine, granular structure; very friable; strongly acid; clear, smooth boundary.

B1t—7 to 14 inches, strong-brown (7.5YR 5/6) to yellowish-red (5YR 4/6) clay loam; weak, fine and medium, subangular blocky structure; friable; a few clay films; strongly acid; clear, smooth boundary.

B21t—14 to 22 inches, yellowish-red (5YR 4/6) to red (2.5YR 4/6) clay loam; moderate, medium, subangular blocky structure; friable; common clay films; strongly acid; gradual, smooth boundary.

B22t—22 to 38 inches, red (2.5YR 4/6) to dark-red (2.5YR 3/6) clay loam; moderate, medium, subangular blocky structure; friable to firm; common clay films; strongly acid; gradual, wavy boundary.

B23t—38 to 60 inches, red (2.5YR 4/6) to dark-red (2.5YR 3/6) clay loam; moderate, medium, subangular blocky structure; friable to firm; common clay films; strongly acid; gradual, wavy boundary.

Figure 27.—Old alluvium that is about 10 feet thick over limestone rock and is the parent material of the Waynesboro soils.

C—60 to 96 inches +, red (2.5YR 4/6) and yellowish-red (5YR 4/6) clay loam with common, medium, distinct variegations of yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6); weak, fine and medium, subangular blocky structure; friable; strongly acid.

Texture in the B22t and B23t horizons ranges from clay loam to clay. In many places the Ap and B1t horizons are silt loam. In a few places the B23t horizon is dark red (10R 3/6).

Whitwell Series.—The soils of the Whitwell series are Paraquic Normudults in a fine loamy, siliceous, thermic family. They formed in alluvium on low stream terraces and are moderately well drained or somewhat poorly drained.

The Whitwell soils are associated with the Sequatchie soils but are less well drained, as indicated by a grayer color and by more mottling in the lower part of the solum.

Representative profile of Whitwell loam in an area 1 mile north of Viola along Hickory Creek:

Ap—0 to 8 inches, brown (10YR 4/3) loam; weak, fine, granular structure; very friable; strongly acid; clear, smooth boundary.

B1—8 to 14 inches, yellowish-brown (10YR 5/4) loam; weak, fine, subangular blocky structure; friable; strongly acid; gradual, smooth boundary.

B2t—14 to 24 inches, yellowish-brown (10YR 5/6) clay loam with common medium mottles of grayish brown (10YR 5/2) and strong brown (7.5YR 5/6); moderate, medium, subangular blocky structure; friable; few clay films, strongly acid; gradual, smooth boundary.

B3t—24 to 40 inches, light olive-brown (2.5Y 5/4) clay loam or loam with many distinct mottles of light brownish gray (10YR 6/2); weak, medium, subangular blocky structure; friable; a few clay films; common, small, black concretions; strongly acid; gradual, smooth boundary.

C—40 to 60 inches, light brownish-gray (10YR 6/2) loam with many distinct mottles of strong brown (7.5YR 5/6) and pale yellow (2.5Y 7/4) ; massive (structureless) ; friable ; a few, small, black concretions ; strongly acid ; layer is 1 to several feet thick.

The surface texture is commonly loam but is sandy loam in some places. The plow layer ranges from brown to grayish brown, and the B1 horizon ranges from yellowish brown to brown. Some areas are less well drained than others and are mottled at a depth of 9 to 15 inches. In other areas mottles are less common and the soil is friable and well drained to a depth of 20 to 30 inches. The texture of the B2t horizon ranges from loam to clay loam.

General Nature of the County

This section discusses the settlement, population, and climate of Warren County and gives information about industry and agriculture.

Settlement

Warren County was established by an act of the Tennessee General Assembly on November 26, 1807 (*12*). It was organized as a county on February 1, 1808, and was named for Gen. Joseph Warren.

In the census of 1859, more than one-third of the 10,179 inhabitants in the county listed North Carolina and Virginia as their place of birth. In 1850 the economy was based on agriculture, and the census of that year shows that most of the inhabitants were farmers.

Population

According to the 1960 census, the population of Warren County was 23,102, an increase of 3.7 percent since 1950. In 1960, 39 percent of the population was listed as urban, 34.5 percent as rural nonfarm, and 26.5 percent as rural farm (*3*).

McMinnville, the county seat, had a population of 9,013 in 1960. It is the only incorporated town in the county. Other towns are Centertown, Dibrell, Irving College, Morrison, Rock Island, and Viola.

Climate [6]

In common with much of Tennessee and the southeastern United States, Warren County has mild winters, warm summers, and abundant annual rainfall. Although the county is far inland, it lies in the path of cold air currents moving southward from Canada and of warm, moist air currents moving northward from the Gulf of Mexico. Consequently, daily and seasonal changes are great.

Some parts of the county are dissected, hilly, and rough, and other parts are nearly level to undulating. On the average, the elevation is about 1,000 feet above sea level; only a few places in the mountains rise above 1,200 feet. The differences in elevation are not great enough to cause significant differences in climate, but they can cause local variation in daily weather. Summarized in table 9 are climatic data from the U.S. Weather Bureau Station at McMinnville. This station is near the center of the county, at an elevation of 940 feet, and its temperature and precipitation data are fairly representative of the entire county.

Temperature.—The average annual temperature at McMinnville is 60° F. It can be seen in table 9 that the average lowest daily temperature ranges from near freezing in winter to the middle 60's in summer and that the average highest daily temperature ranges from the low 50's in winter to the high 80's in summer. A temperature above 100° or below 0° is rare, but extremes of 104° and −19° were recorded between 1931 and 1960. Prolonged periods of very cold or very hot, humid weather are unusual because they are broken by many warm periods in winter and by occasional mild periods with low humidity in summer.

At McMinnville the average date of the last freeze in spring is April 8, and that of the first in fall is October 28. The interval between these dates, or the average growing season, is 203 days. Figure 28 shows the probabilities of the temperature dropping to 32°, 28°, and 24° after any given date in spring. For example, suppose you wish to find the last date in spring on which a temperature of 28° or less can be expected with a 20 percent probability (2 years in 10). Start with the probability of 20 percent at the top of the graph and follow the vertical line down until it intersects the line labeled 28°. From this point, follow the horizontal line to the left margin and you will see the date is about April 9. The probabilities of freezing temperature before any given date in fall are shown in figure 29. To find the earliest date of a freeze at a selected probability, read downward from the top of the graph to the desired fall temperature line, and then to the left margin for the date.

The freeze-free growing season is long enough to permit corn, hay, vegetables, and other crops to be planted over a period of a few weeks and still have time to mature (*4*). The winters are mild enough that fall-sown small grain survives well and furnishes some grazing for livestock during winter. Pasture grasses also make substantial growth in winter because, on many days, the average temperature is above 40°.

Precipitation.—Warren County has an average annual rainfall of about 52 inches, an amount that normally provides adequate moisture for farming and enough water for other needs. At McMinnville the total annual rainfall between 1931 and 1960 ranged from 37.30 inches in 1947 to 68.03 inches in 1957.

Normally, precipitation is greatest in winter and early in spring (see table 9). During those months low pressure systems pass more frequently through the county and cause general rains. In summer, when local showers and thunderstorms are most frequent, precipitation is near the average for all months. Average precipitation is lightest in fall because of the greater frequency of high pressure systems. Table 9 indicates that 1 year in 10, on the average, will have less than 1 inch of rain in some months of the growing season and that rainfall exceeds normal by 1.9 inches or more each month, 1 year in 10. Thus, though periods of severe drought occur, there are also periods of

[6] This section was written by MORTON BAILEY, State climatologist, U.S. Weather Bureau, Nashville, Tenn.

TABLE 9.—*Temperature and precipitation for McMinnville, Warren County, Tenn.*

[Elevation 940 feet]

Month	Temperature [1] [2]				Precipitation			
	Average daily maximum	Average daily minimum	2 years in 10 will have at least 4 days with—		Average total [3]	1 year in 10 will have—		Average snowfall [4]
			Maximum temperature equal to or higher than	Minimum temperature equal to or lower than		Less than [3]—	More than [3]—	
	°F.	°F.	°F.	°F.	Inches	Inches	Inches	Inches
January	52. 2	32. 5	70	11	5. 70	2. 0	12. 1	2. 0
February	54. 1	33. 0	69	16	5. 64	2. 5	10. 7	1. 6
March	62. 0	39. 2	77	23	5. 34	3. 2	8. 8	. 8
April	70. 8	47. 3	83	33	3. 83	1. 8	5. 8	(5)
May	79. 5	55. 6	89	43	3. 90	2. 1	6. 3	(5)
June	87. 0	64. 3	96	55	4. 12	0. 8	6. 8	0
July	88. 5	67. 5	96	60	4. 65	2. 0	7. 8	0
August	87. 7	66. 7	95	58	4. 12	1. 9	6. 5	0
September	83. 6	60. 0	92	47	3. 50	0. 8	5. 8	0
October	74. 6	48. 3	86	33	2. 44	0. 5	4. 6	(5)
November	60. 8	37. 8	75	23	3. 68	1. 3	7. 4	. 4
December	52. 7	32. 8	67	17	5. 08	2. 2	9. 4	2. 1
Year	71. 1	48. 8	[6] 98	[7] 5	52. 00	42. 7	60. 8	6. 9

[1] Temperatures referred to in this summary were measured in standard Weather Bureau instrument shelters with thermometer 4.5 feet above the ground. On clear, calm nights temperature at shelter level normally is about 5 degrees warmer than the air temperature near the ground, but this difference can amount to as much as 12 degrees.

[2] From data available for 21 years between 1931 and 1952.

[3] From 1931 to 1960.

[4] From data available for 18 years between 1931 and 1952.

[5] Trace.

[6] Average annual highest temperature between 1931 and 1960.

[7] Average annual lowest temperature between 1931 and 1960.

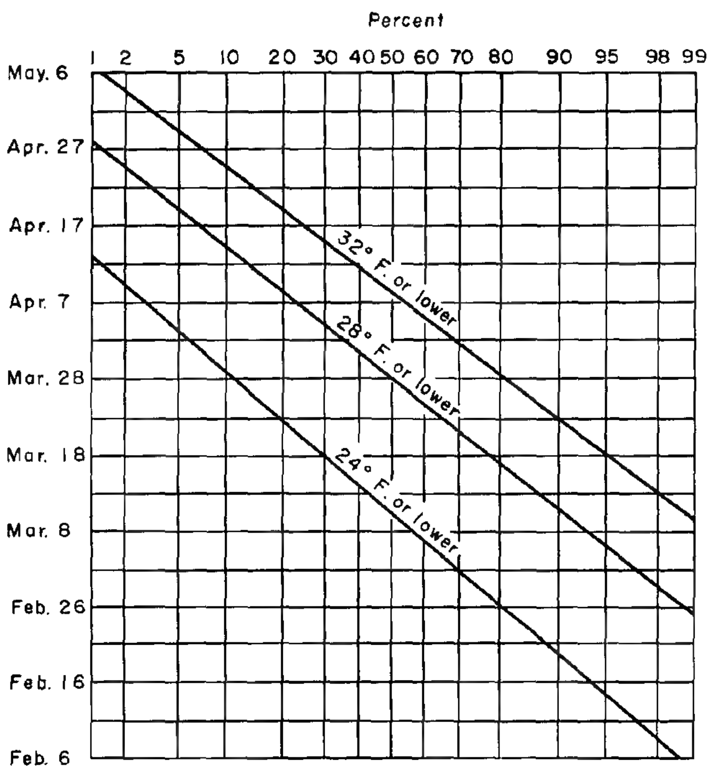

Figure 28.—Probability that the temperature at McMinnville will be 24° F. or lower, 28° or lower, or 32° or lower before any given date in spring.

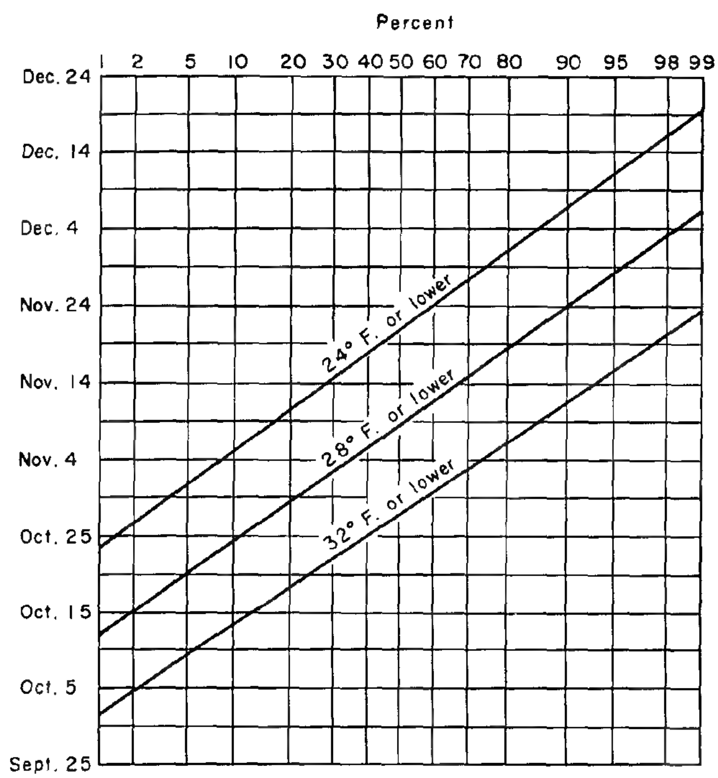

Figure 29.—Probability that the temperature at McMinnville will be 24° F. or lower, 28° or lower, or 32° or lower after any given date in fall.

plentiful rainfall in all seasons, as well as periods of excessive rainfall.

The county is subject to heavy local rainstorms that frequently bring 4 inches of rain and occasionally much more. The greatest amounts of precipitation in a 24-hour period were 11.00 inches at McMinnville on March 28, 1902, and 10.31 inches at Rock Island on March 23, 1929. Heavy rains cause flash floods along the small streams of the county.

Water balance.—Figure 30 indicates the average water balance throughout the year. Shown on the graph are curves for average monthly precipitation, potential evapotranspiration, and actual evapotranspiration that can be used to determine moisture conditions in the soils at the end of each month. Computations for figure 30 are by the Thornthwaite method (*6*). The available moisture at field capacity is assumed to be 4 inches.

Field capacity is the moisture content of a soil after the gravitational, or free, water has drained away; it is the field moisture content 2 or 3 days after a soaking rain. Evapotranspiration is the combined loss of water through evaporation and through transpiration by plants. Actual evapotranspiration is the actual loss of soil moisture. It is less than the potential evapotranspiration because, as a soil dries, the moisture remaining in the soil is more tightly held and, therefore, is less readily removed by transpiration and evaporation.

As shown in figure 30, there is a surplus of precipitation over estimated evapotranspiration from January through most of May in an average year. From the last of May through nearly all of October, actual evapotranspiration exceeds precipitation. Near the end of October, 2.95 inches of the original 4 inches of available water have been removed from the soil. By the end of October, precipitation again exceeds evapotranspiration and begins to replace the moisture lost during summer. Early in December the soil reaches field capacity, and again there is a surplus of precipitation over evapotranspiration. This excess precipitation is lost from the soil by surface or subsurface runoff.

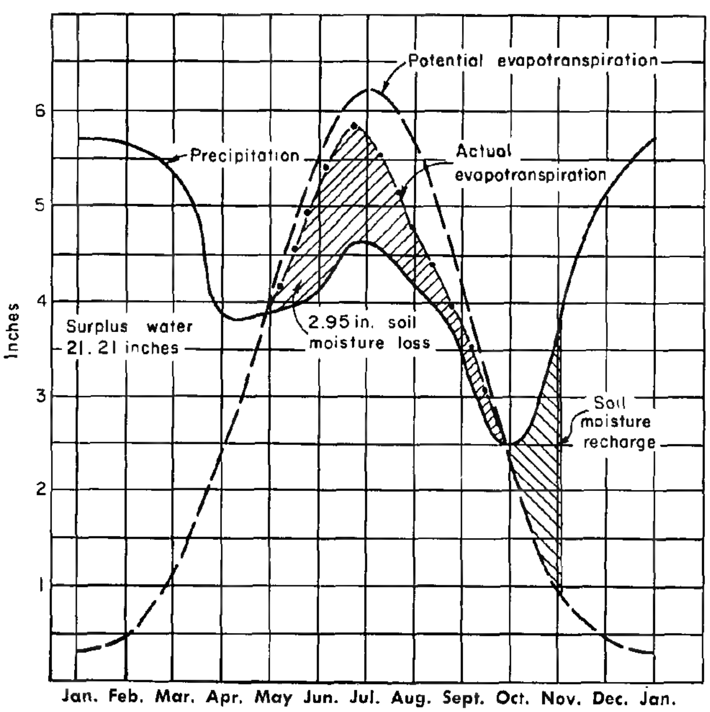

Figure 30.—The average water balance at McMinnville, Tenn.

The moisture conditions shown in figure 30 are for the end of each month; variations for shorter periods are not shown. For example, in any month that has near-normal rainfall and temperature, the soil is at field capacity after it is saturated by a heavy rain, but its content of moisture is much lower after several days without rain. Besides, conditions vary considerably from year to year, especially during the warm months, because of variations in rainfall, temperature, and other factors.

The rate of plant growth is affected greatly by the amount of moisture available in the soil. The vertical distance between the actual and the potential evapotranspiration curves indicates the average amount of irrigation water needed to maintain maximum plant growth. This deficit in the soil moisture results because the precipitation in summer normally is not enough to replace moisture lost by evaporation and to meet the needs of growing plants.

Severe storms.—Severe storms are infrequent in Warren County. Only three tornadoes were reported in the county between 1916 and 1962. The county is too far inland for tropical storms to cause damage. Thunderstorms occur on about 55 days a year at any one place, and most of them come late in spring and in summer. Hailstorms occur at a given locality about twice a year.

Humidity, wind, and clouds.—On the basis of records kept at nearby weather stations, the average annual relative humidity in Warren County is about 70 percent. Throughout the day it generally rises or falls inversely as the temperature rises and falls and is, therefore, highest early in the morning and lowest early in the afternoon. At 5:00 a.m. the relative humidity is 90 percent or higher about half the time, and at 3:00 p.m. it is 50 percent or lower about half the time. Also, the relative humidity is highest in winter and lowest in spring.

The prevailing wind is from the south, and the average monthly windspeed ranges from about 5 miles per hour in August to 9 miles per hour in March. Generally, the wind is lightest early in the morning and is strongest early in the afternoon.

Clouds cover less than 0.6 of the sky, on an average, between sunrise and sunset. The range is from just less than 0.7 in winter to slightly less than 0.5 in fall. Thus, sunshine is abundant during the growing season because there are fewer clouds and many hours of daylight.

Industry

Industry has been increasingly important in recent years. In the county are four lumber companies, two shops for manufacturing machinery, and two milk plants. In addition, there are shirt, shoe, and garment factories and silk and hosiery mills.

Agriculture

The Census of Agriculture reports that, in 1959, there were 210,113 acres, or about 75 percent of the total land area, in farms that averaged 114.0 acres. In 1950, the average size was 85.4. Of the 1,828 farms in the county in 1959, those occupying between 10 and 49 acres were

Figure 31.—Plantations of ornamental shrubs on a farm that produces nursery stock.

most common. Two farms reported 500 acres or more in cropland harvested, 93 farms reported 100 to 200 acres, and 399 farms reported 10 acres or less.

Between 1960 and 1962, the acreage in corn harvested decreased from 18,200 acres to 11,000 acres and the total production decreased from 755,000 bushels to 418,000 bushels (*5*). In 1960, 40,200 bushels of wheat was harvested from 1,750 acres, but by 1962, this amount decreased to 19,800 bushels from 900 acres. The total production of cotton is small; it decreased from 165 bales in 1960 to 37 bales in 1962. In contrast, the production of burley tobacco increased from 250,000 pounds to 348,000 pounds during the same period.

Farming in this county is diversified, and many farms produce only for home use. According to the census, 1,085 farms were miscellaneous and unclassified in 1959. More than two million dollars worth of nursery products was produced on 221 farms (fig. 31). There were 363 livestock farms, 211 dairy farms, 106 general farms, and 30 cash-grain or tobacco farms.

In 1959, about 26 percent of the farmland, or 77,742 acres, was pastured. Of this acreage more than one-fifth was woodland used for pasture. The grazing season extends from about March 15 to December 1.

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Glossary

Acidity. See Reaction.

Aggregate, soil. A mass or cluster of many fine soil particles held together in the form of a clod, crumb, block, or prism.

Alluvium. Soil materials deposited on land by streams.

Alluvium, local. Mixed deposits of rock fragments and coarse soil materials near the base of steep slopes. The deposits have accumulated as the result of local wash, slides, and soil creep.

Available water capacity. The difference between the amount of water in a soil at field capacity and the amount in the same soil at the permanent wilting point. Commonly expressed as inches of water per inch depth of soil.

Bedrock. The solid rock underlying soils.

Chert. A structureless form of silica (SiO_2) that breaks into angular fragments. Soils containing large quantities of fragments as much as 3 inches across are called cherty soils.

Clay. (1) As a soil separate, mineral grains less than 0.002 millimeter in diameter. (2) As a textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 45 percent silt.

Colluvium. See Alluvium, local.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Some of the terms commonly used to describe consistence are—

Loose.—Noncoherent; soil does not hold together in a mass.

Friable.—When moist, soil crushes easily under gentle pressure between thumb and forefinger and can be pressed together in a lump.

Firm.—When moist, soil crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, soil is readily deformed by moderate pressure but can be pressed into a lump; forms a "wire" when rolled between thumb and forefinger.

Hard.—When dry, soil is moderately resistant to pressure but is difficult to break between thumb and forefinger.

Compact.—A combination of firm consistence and close packing or arrangement of soil particles.

Eluviation. The removal of material from a soil horizon by downward or lateral movement in solution and, to a lesser extent, in colloidal suspension. Soil horizons that have lost material through eluviation are eluviated; those that have received material are illuviated.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. See First bottom.

Fragipan. A dense or brittle pan or layer that is hard mainly because of extreme density or compactness rather than because of cementation or content of clay. Removed fragments are friable, but the material in place is so dense that roots cannot penetrate it, and water moves through it very slowly.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characterisrics produced by soil-forming processes and that differs in one or more ways from adjacent horizons in the same profile. These are the major soil horizons:

Horizon A.—The mineral horizon at the surface. It contains an accumulation of organic matter, has been leached of soluble minerals and clay, or shows the effects of both.

Horizon B.—The horizon in which clay minerals or other minerals have accumulated, that has developed a characteristic blocky or prismatic structure, or that shows the characteristics of both processes.

Horizon C.—The horizon of partly weathered material or of material unweathered in place. The material in the C horizon is either like or unlike that from which the overlying soils were formed.

Loess. A geological deposit of relatively uniform, fine material, mostly silt, presumably transported by wind.

Morphology, soil. The physical constitution of the soil, including the thickness and arrangement in the profile, and the texture, structure, consistence, color, and other physical and chemical properties of the various soil horizons that make up the soil profile.

Mottles. Irregular spots or patches of different colors. A common cause of mottling is imperfect or impeded drainage. Different kinds of minerals may cause mottling. Mottles are described by abundance, size, and grade or distinctness.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Parent material. The horizon of weathered rock or partly weathered soil material from which the soil is formed. See also Horizon C; Profile, soil; and Substratum.

Permeability. The quality of a soil that enables it to transmit water and air, measured in terms of rate of flow of water through a unit cross section of saturated soil in unit time. The permeability of a soil may be limited by one impermeable horizon, even though the other horizons are permeable. Following is a list of ratings, expressed in words, and in inches per hour:

	Inches per hour
Slow	Less than 0.2
Moderately slow	0.2 to 0.8
Moderate	0.8 to 2.5
Moderately rapid	2.5 to 5.0

pH. A numerical means of designating acidity and alkalinity, as in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Phase, soil. A subdivision of a soil type. A soil phase varies from the type chiefly in such external characteristics as slope, stoniness, or erosion.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material. See Horizon, soil.

Reaction, soil. The degree of acidity or alkalinity of a soil expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. In words, the degrees of acidity or alkalinity are expressed as follows:

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum. Unconsolidated and partly weathered parent material presumed to have developed from the same kind of rock as that on which it lies.

Sand. (1) As a soil separate, particles ranging in diameter from 0.05 millimeter to 2.0 millimeters. (2) As a textural class, soil material that is 85 percent or more sand and not more than 10 percent clay.

Second bottom. The first terrace level above the flood plain, rarely or never flooded. See First bottom.

Series, soil. A group of soils similar in all respects except the texture of the surface soil.

Silt. (1) As a soil separate, particles ranging in diameter from 0.002 to 0.05 millimeter. (2) As a textural class, soil material that is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate, and living matter acting upon parent material, as conditioned by relief over periods of time.

Soil association. A group of soils that occur together in a characteristic pattern.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. Structure is described by grade (*weak*, *moderate*, or *strong*), that is, the distinctness and durability of the aggregates; by the size of the aggregates (*very fine*, *fine*, *medium*, *coarse*, or *very coarse*); and by their shape (*platy*, *prismatic*, *columnar*, *blocky*, *granular*, or *crumb*). A soil is described as structureless if there are no observable aggregates. Structureless soils may be *massive* (coherent) or *single grain* (noncoherent).

Subsoil. That part of the profile below plow depth and above the parent material. It may be the B horizon in soils with distinct horizons.

Substratum. Any layer beneath the solum, or true soil. The parent material or other layers unlike the parent material that lie below the B horizon, or subsoil. See also Horizon C and Parent material.

Surface soil. Technically, the A horizon. The surface layer. The plow layer, or its equivalent in uncultivated soil, about 5 to 8 inches thick.

Talus. Fragments of rock and soil material collected at the foot of cliffs or steep slopes, mainly as the result of gravity.

Terrace, geological. A generally flat or undulating area that was part of an alluvial plain before the adjacent streambed was lowered to its present level; frequently called a second bottom to distinguish it from the flood plain, or first bottom; seldom subject to overflow.

Texture, soil. The relative proportion of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportions of fine particles, are: *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Topsoil. Presumably fertile soil material, generally rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Type, soil. A subdivision of the soil series that is made on the basis of differences in the texture of the surface layer.

Upland, geologic. Land consisting of material unworked by water in recent geologic time and ordinarily lying at a higher elevation than an alluvial plain or a stream terrace.

U S. GOVERNMENT PRINTING OFFICE: 1967

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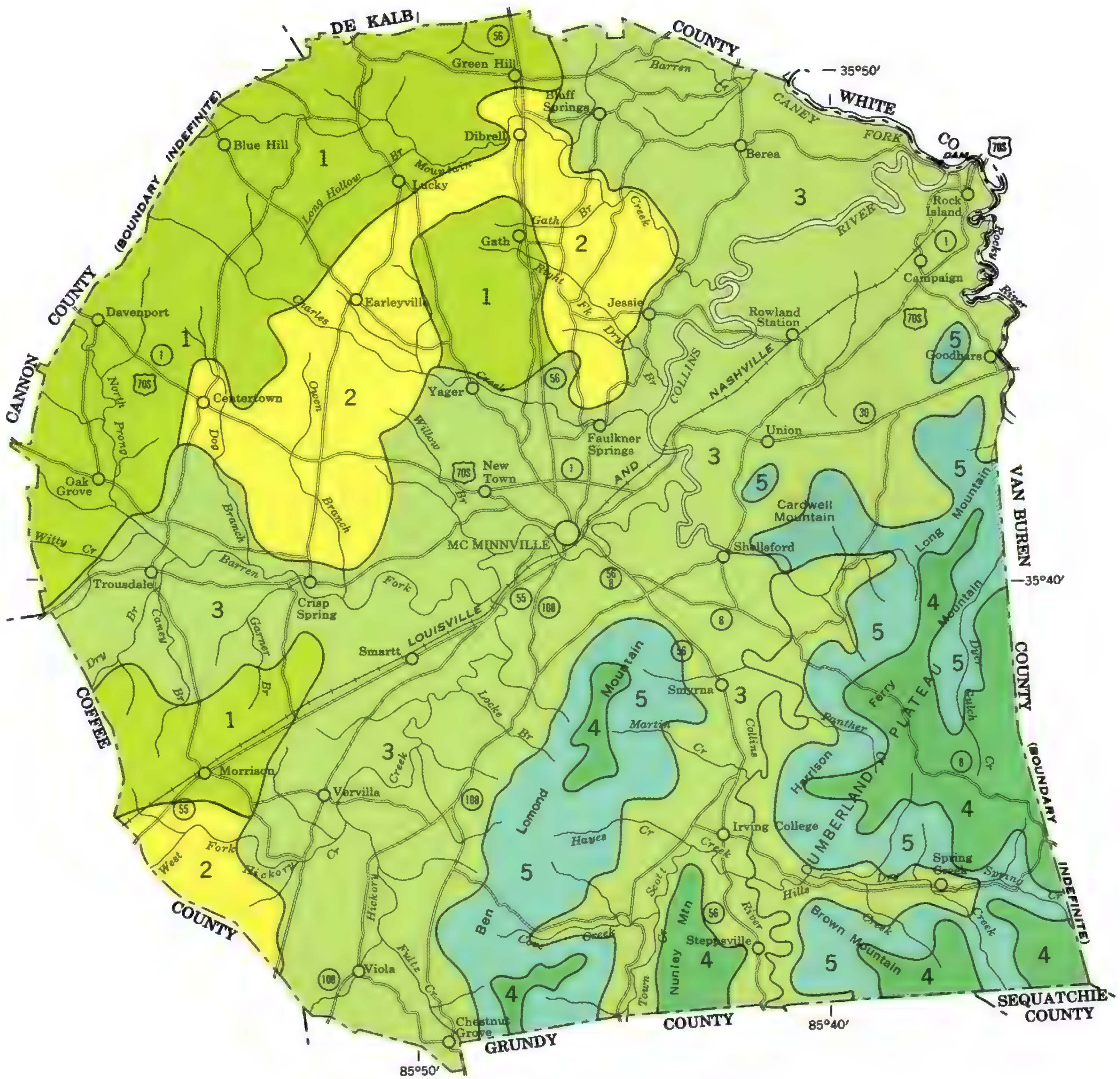

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TENNESSEE AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
WARREN COUNTY, TENNESSEE

Scale 1:190,080

1 0 1 2 3 4 Miles

SOIL ASSOCIATIONS

SOILS OF THE HIGHLAND RIM

1 Dickson-Mountview association: Light-colored, silty soils on gently rolling hills and flats

2 Baxter-Mountview association: Clayey and silty soils on rolling hills

3 Waynesboro-Cumberland association: Red, clayey and loamy soils on terraces

SOILS OF THE CUMBERLAND PLATEAU

4 Hartsells-Ramsey association: Loamy soils on the Cumberland Plateau

5 Rock land-Stony colluvial land association: Steep, rough, and rocky land on escarpments of the Cumberland Plateau

December 1965

GUIDE TO MAPPING UNITS

[See table 1, p. 7 for approximate acreage and proportionate extent of the soils and table 2, p. 36 for estimated yields of principal crops. See pp. 44 to 57 for information on engineering uses]

Map symbol	Mapping unit	Described on page	Capability unit: Unit	Capability unit: Page	Woodland suitability group: Group	Woodland suitability group: Page
AaD3	Allen clay loam, 12 to 20 percent slopes, severely eroded	8	VIe-1	34	3	39
AcD	Allen cobbly loam, 5 to 20 percent slopes	8	VIs-1	35	3	39
AcE	Allen cobbly loam, 20 to 30 percent slopes	8	VIs-1	35	3	39
AnB	Allen loam, 2 to 5 percent slopes	8	IIe-2	29	3	39
AnC	Allen loam, 5 to 12 percent slopes	8	IIIe-2	31	3	39
AnD	Allen loam, 12 to 20 percent slopes	8	IVe-1	33	3	39
AnE	Allen loam, 20 to 30 percent slopes	8	VIe-1	34	3	39
BaC	Baxter cherty silt loam, 5 to 12 percent slopes	9	IIIe-4	32	5	42
BaD	Baxter cherty silt loam, 12 to 20 percent slopes	9	IVe-2	33	5	42
BaE	Baxter cherty silt loam, 20 to 30 percent slopes	9	VIe-2	34	5	42
BaF	Baxter cherty silt loam, 30 to 50 percent slopes	9	VIIe-1	35	5	42
BcC3	Baxter cherty silty clay loam, 5 to 12 percent slopes, severely eroded	10	IVe-2	33	5	42
BcD3	Baxter cherty silty clay loam, 12 to 20 percent slopes, severely eroded	10	VIe-2	34	5	42
BcE3	Baxter cherty silty clay loam, 20 to 30 percent slopes, severely eroded	10	VIe-2	34	5	42
BoE	Bodine cherty silt loam, 20 to 45 percent slopes	10	VIIs-2	35	5	42
Br	Bruno loamy sand	11	IIIs-1	33	10	43
CaB	Captina silt loam, 1 to 3 percent slopes	11	IIe-3	30	7	42
ChB2	Christian silt loam, 2 to 5 percent slopes, eroded	11	IIIe-4	32	6	42
ChC	Christian silt loam, 5 to 12 percent slopes	12	IVe-2	33	6	42
ChC2	Christian silt loam, 5 to 12 percent slopes, eroded	12	IVe-2	33	6	42
ChD	Christian silt loam, 12 to 20 percent slopes	12	VIe-2	34	6	42
ChD2	Christian silt loam, 12 to 20 percent slopes, eroded	12	VIe-2	34	6	42
CnC3	Christian silty clay loam, 5 to 12 percent slopes, severely eroded	13	VIe-2	34	6	42
CnD3	Christian silty clay loam, 12 to 20 percent slopes, severely eroded	13	VIe-2	34	6	42
Co	Cobbly alluvial land	13	VIIs-1	35	12	43
CsA	Cumberland silt loam, 0 to 2 percent slopes	13	I-1	29	3	39
CsB	Cumberland silt loam, 2 to 5 percent slopes	13	IIe-1	29	3	39
CsC2	Cumberland silt loam, 5 to 12 percent slopes, eroded	14	IIIe-1	31	3	39
CuC3	Cumberland silty clay loam, 5 to 12 percent slopes, severely eroded	14	IVe-1	33	3	39
CuD3	Cumberland silty clay loam, 12 to 20 percent slopes, severely eroded	14	VIe-1	34	3	39
DkB	Dickson silt loam, 1 to 4 percent slopes	14	IIe-3	30	7	42
Du	Dunning silty clay loam	15	IIIw-1	32	8	43
Ek	Elkins silt loam	15	IIIw-1	32	11	43
EtC	Etowah cherty silt loam, 5 to 12 percent slopes	16	IIIe-1	31	2	39
EtD	Etowah cherty silt loam, 12 to 20 percent slopes	16	IVe-1	33	2	39
EtE	Etowah cherty silt loam, 20 to 30 percent slopes	16	VIe-1	34	2	39
EwB	Etowah silt loam, 2 to 5 percent slopes	15	IIe-1	29	2	39
EwC	Etowah silt loam, 5 to 12 percent slopes	16	IIIe-1	31	2	39
EwD	Etowah silt loam, 12 to 20 percent slopes	16	IVe-1	33	2	39
Gd	Gullied land	16	VIIe-2	35	13	43
Gu	Guthrie silt loam	17	IVw-1	34	11	43
HaB	Hartsells loam, 2 to 5 percent slopes	17	IIe-2	29	4	41
HaC	Hartsells loam, 5 to 12 percent slopes	17	IIIe-2	31	4	41
Hr	Huntington cherty silt loam	18	IIs-1	31	1	39
Hu	Huntington silt loam	17	I-1	29	1	39
JeB	Jefferson loam, 2 to 5 percent slopes	18	IIe-2	29	4	41
JeC	Jefferson loam, 5 to 12 percent slopes	18	IIIe-2	31	4	41
JeD	Jefferson loam, 12 to 20 percent slopes	18	IVe-1	33	4	41
JeD3	Jefferson loam, 12 to 20 percent slopes, severely eroded	18	VIe-1	34	4	41
JsD	Jefferson cobbly sandy loam, 5 to 20 percent slopes	19	VIs-1	35	4	41
La	Lawrence silt loam	19	IIIw-2	33	11	43
Ln	Lindside silt loam	19	IIw-1	30	1	39
LrB	Linker loam, 2 to 5 percent slopes	20	IIe-2	29	4	41
LrC	Linker loam, 5 to 12 percent slopes	20	IIIe-2	31	4	41
Me	Melvin silt loam	20	IIIw-1	32	11	43
MnB	Minvale silt loam, 2 to 5 percent slopes	20	IIe-1	29	2	39
MnC	Minvale silt loam, 5 to 12 percent slopes	21	IIIe-1	31	2	39
MoB	Mountview silt loam, 2 to 5 percent slopes	21	IIe-2	29	4	41
MoC	Mountview silt loam, 5 to 12 percent slopes	21	IIIe-2	31	4	41
MoC3	Mountview silt loam, 5 to 12 percent slopes, severely eroded	21	IVe-1	33	4	41
RaC	Ramsey loam, 5 to 12 percent slopes	22	VIe-3	35	9	43
RaD	Ramsey loam, 12 to 20 percent slopes	22	VIe-3	35	9	43
RaE	Ramsey loam, 20 to 30 percent slopes	22	VIe-3	35	9	43
RcD	Ramsey very rocky sandy loam, 10 to 20 percent slopes	22	VIIs-2	35	9	43
RfE	Ramsey-Jefferson stony complex, 20 to 45 percent slopes	22	VIIs-2	35	9	43
Ro	Rock land	23	VIIs-2	35	13	43
Sa	Sango silt loam	23	IIe-3	30	7	42
SeA	Sequatchie loam, 0 to 2 percent slopes	23	I-1	29	1	39
SeB	Sequatchie loam, 2 to 5 percent slopes	23	IIe-1	29	1	39
SeC2	Sequatchie loam, 5 to 12 percent slopes, eroded	24	IIIe-1	31	1	39
StA	Staser sandy loam, 0 to 2 percent slopes	24	I-1	29	1	39
StD	Staser sandy loam, 10 to 25 percent slopes	24	VIe-1	34	1	39
Su	Stony colluvial land	24	VIIs-2	35	12	43
SwC2	Swaim silt loam, 3 to 10 percent slopes, eroded	24	IVe-2	33	6	42
TaC	Talbott silt loam, 5 to 12 percent slopes	25	IVe-2	33	6	42
TrC2	Talbott very rocky complex, 5 to 20 percent slopes, eroded	25	VIIs-2	35	13	43
TrE2	Talbott very rocky complex, 20 to 30 percent slopes, eroded	25	VIIs-2	35	13	43
WaA	Waynesboro loam, 0 to 2 percent slopes	25	I-1	29	3	39
WaB	Waynesboro loam, 2 to 5 percent slopes	25	IIe-2	29	3	39
WaC	Waynesboro loam, 5 to 12 percent slopes	26	IIIe-2	31	3	39
WaC2	Waynesboro loam, 5 to 12 percent slopes, eroded	26	IIIe-2	31	3	39
WaD2	Waynesboro loam, 12 to 20 percent slopes, eroded	26	IVe-1	33	3	39
WaE	Waynesboro loam, 20 to 30 percent slopes	26	VIe-1	34	3	39
WcC3	Waynesboro clay loam, 5 to 12 percent slopes, severely eroded	26	IVe-1	33	3	39
WcD3	Waynesboro clay loam, 12 to 20 percent slopes, severely eroded	26	VIe-1	34	3	39
WcE3	Waynesboro clay loam, 20 to 30 percent slopes, severely eroded	26	VIe-1	34	3	39
WgD3	Waynesboro gravelly clay loam, 12 to 30 percent slopes, severely eroded	27	VIe-1	34	3	39
WsC2	Waynesboro gravelly sandy loam, 5 to 12 percent slopes, eroded	27	IIIe-3	32	3	39
Ww	Whitwell loam	27	IIw-1	30	1	39

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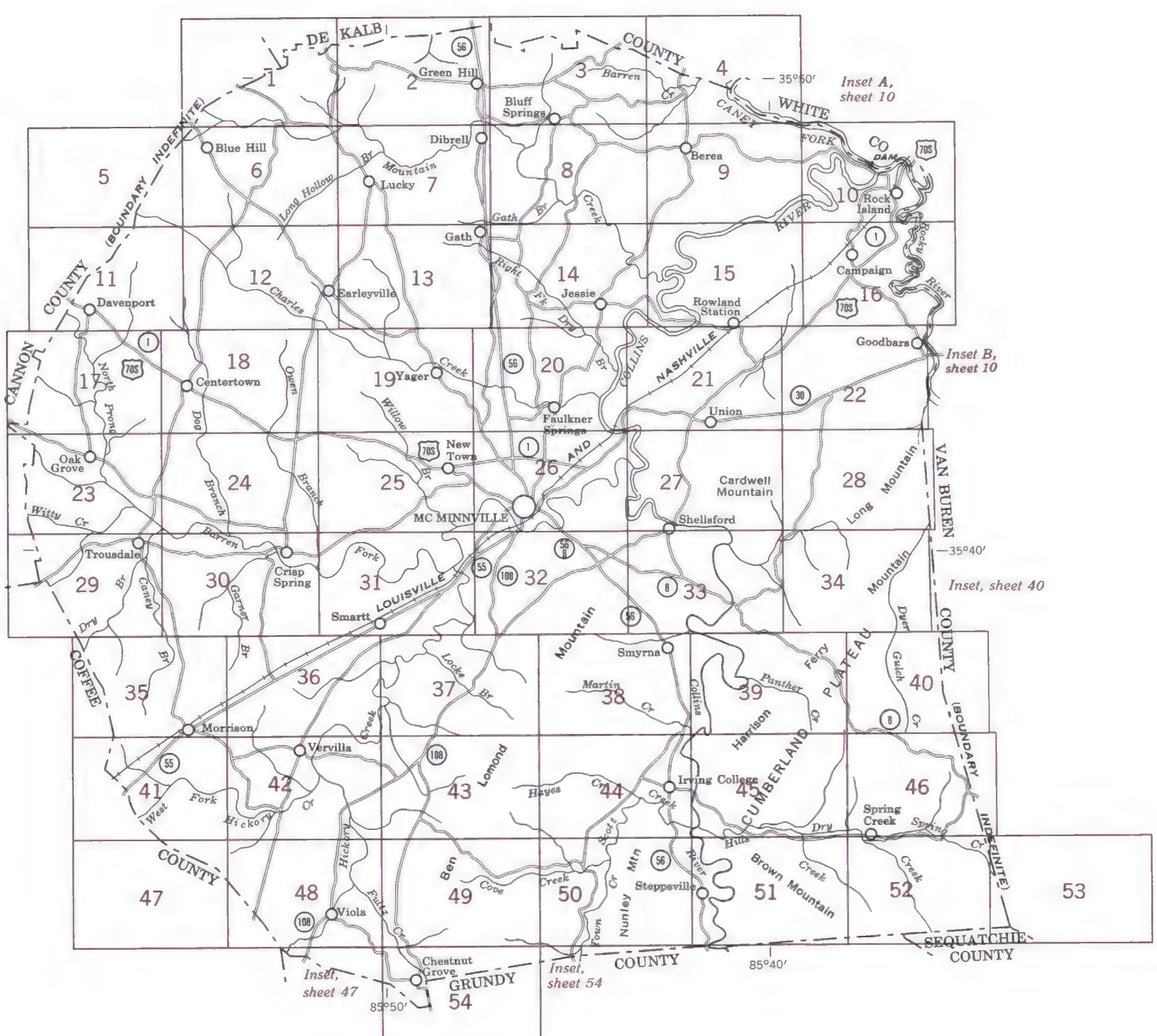


INDEX TO MAP SHEETS

WARREN COUNTY, TENNESSEE

Scale 1:190,080

1 0 1 2 3 4 Miles

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, and F, indicates the slope. Symbols for nearly level soils, such as Huntington silt loam, do not contain a slope letter. Neither do the symbols for some land types that have a considerable range in slope, such as Rock land. A final number, 2 or 3, in the symbol indicates that the soil is eroded, or severely eroded.

SYMBOL	NAME
AaD3	Allen clay loam, 12 to 20 percent slopes, severely eroded
AcD	Allen cobbly loam, 5 to 20 percent slopes
AcE	Allen cobbly loam, 20 to 30 percent slopes
AnB	Allen loam, 2 to 5 percent slopes
AnC	Allen loam, 5 to 12 percent slopes
AnD	Allen loam, 12 to 20 percent slopes
AnE	Allen loam, 20 to 30 percent slopes
BaC	Baxter cherty silt loam, 5 to 12 percent slopes
BaD	Baxter cherty silt loam, 12 to 20 percent slopes
BaE	Baxter cherty silt loam, 20 to 30 percent slopes
BaF	Baxter cherty silt loam, 30 to 50 percent slopes
BcC3	Baxter cherty silty clay loam, 5 to 12 percent slopes, severely eroded
BcD3	Baxter cherty silty clay loam, 12 to 20 percent slopes, severely eroded
BcE3	Baxter cherty silty clay loam, 20 to 30 percent slopes, severely eroded
BoE	Bodine cherty silt loam, 20 to 45 percent slopes
Br	Bruno loamy sand
CaB	Captina silt loam, 1 to 3 percent slopes
ChB2	Christian silt loam, 2 to 5 percent slopes, eroded
ChC	Christian silt loam, 5 to 12 percent slopes
ChC2	Christian silt loam, 5 to 12 percent slopes, eroded
ChD	Christian silt loam, 12 to 20 percent slopes
ChD2	Christian silt loam, 12 to 20 percent slopes, eroded
CnC3	Christian silty clay loam, 5 to 12 percent slopes, severely eroded
CnD3	Christian silty clay loam, 12 to 20 percent slopes, severely eroded
Co	Cobbly alluvial land
CsA	Cumberland silt loam, 0 to 2 percent slopes
CsB	Cumberland silt loam, 2 to 5 percent slopes
CsC2	Cumberland silt loam, 5 to 12 percent slopes, eroded
CuC3	Cumberland silty clay loam, 5 to 12 percent slopes, severely eroded
CuD3	Cumberland silty clay loam, 12 to 20 percent slopes, severely eroded
DkB	Dickson silt loam, 1 to 4 percent slopes
Du	Dunning silty clay loam
Ek	Elkins silt loam
EtC	Etowah cherty silt loam, 5 to 12 percent slopes
EtD	Etowah cherty silt loam, 12 to 20 percent slopes
EtE	Etowah cherty silt loam, 20 to 30 percent slopes
EwB	Etowah silt loam, 2 to 5 percent slopes
EwC	Etowah silt loam, 5 to 12 percent slopes
EwD	Etowah silt loam, 12 to 20 percent slopes
Gd	Gullied land
Gu	Guthrie silt loam
HaB	Hartsells loam, 2 to 5 percent slopes
HaC	Hartsells loam, 5 to 12 percent slopes
Hr	Huntington cherty silt loam
Hu	Huntington silt loam
JeB	Jefferson loam, 2 to 5 percent slopes
JeC	Jefferson loam, 5 to 12 percent slopes
JeD	Jefferson loam, 12 to 20 percent slopes
JeD3	Jefferson loam, 12 to 20 percent slopes, severely eroded
JsD	Jefferson cobbly sandy loam, 5 to 20 percent slopes
La	Lawrence silt loam
Ln	Lindside silt loam
LrB	Linker loam, 2 to 5 percent slopes
LrC	Linker loam, 5 to 12 percent slopes
Me	Melvin silt loam
MnB	Minvale silt loam, 2 to 5 percent slopes
MnC	Minvale silt loam, 5 to 12 percent slopes
MoB	Mountview silt loam, 2 to 5 percent slopes
MoC	Mountview silt loam, 5 to 12 percent slopes
MoC3	Mountview silt loam, 5 to 12 percent slopes, severely eroded
RaC	Ramsey loam, 5 to 12 percent slopes
RaD	Ramsey loam, 12 to 20 percent slopes
RaE	Ramsey loam, 20 to 30 percent slopes
RcD	Ramsey very rocky sandy loam, 10 to 20 percent slopes
RfE	Ramsey–Jefferson stony complex, 20 to 45 percent slopes
Ro	Rock land
Sa	Sango silt loam
SeA	Sequatchie loam, 0 to 2 percent slopes
SeB	Sequatchie loam, 2 to 5 percent slopes
SeC2	Sequatchie loam, 5 to 12 percent slopes, eroded
StA	Staser sandy loam, 0 to 2 percent slopes
StD	Staser sandy loam, 10 to 25 percent slopes
Su	Stony colluvial land
SwC2	Swaim silt loam, 3 to 10 percent slopes, eroded
TaC	Talbott silt loam, 5 to 12 percent slopes
TrC2	Talbott very rocky complex, 5 to 20 percent slopes, eroded
TrE2	Talbott very rocky complex, 20 to 30 percent slopes, eroded
WaA	Waynesboro loam, 0 to 2 percent slopes
WaB	Waynesboro loam, 2 to 5 percent slopes
WaC	Waynesboro loam, 5 to 12 percent slopes
WaC2	Waynesboro loam, 5 to 12 percent slopes, eroded
WaD2	Waynesboro loam, 12 to 20 percent slopes, eroded
WaE	Waynesboro loam, 20 to 30 percent slopes
WcC3	Waynesboro clay loam, 5 to 12 percent slopes, severely eroded
WcD3	Waynesboro clay loam, 12 to 20 percent slopes, severely eroded
WcE3	Waynesboro clay loam, 20 to 30 percent slopes, severely eroded
WgD3	Waynesboro gravelly clay loam, 12 to 30 percent slopes, severely eroded
WsC2	Waynesboro gravelly sandy loam, 5 to 12 percent slopes, eroded
Ww	Whitwell loam

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail, foot
- Railroad
- Ferries
- Ford
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings
- School
- Church

Cave opening

Mines and Quarries

Mine dump

Pits, gravel or other

Power lines

Pipe lines

Cemeteries

Dams

Levees

Tanks

Forest fire or lookout station

BOUNDARIES

- National or state
- County
- Reservation
- Land grant

DRAINAGE

Streams
- Perennial
- Intermittent
- Crossable with tillage implements
- Not crossable with tillage implements

Canals and ditches — CANAL, DITCH

Lakes and ponds
- Perennial
- Intermittent

Wells — flowing

Springs

Marsh

Wet spot

Alluvial fan

RELIEF

Escarpments
- Bedrock
- Other

Prominent peaks

Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements

SOIL SURVEY DATA

Soil boundary and symbol — Dx

Gravel

Stones

Rock outcrops

Chert fragments

Clay spot

Sand spot

Gumbo or scabby spot

Made land

Severely eroded spot

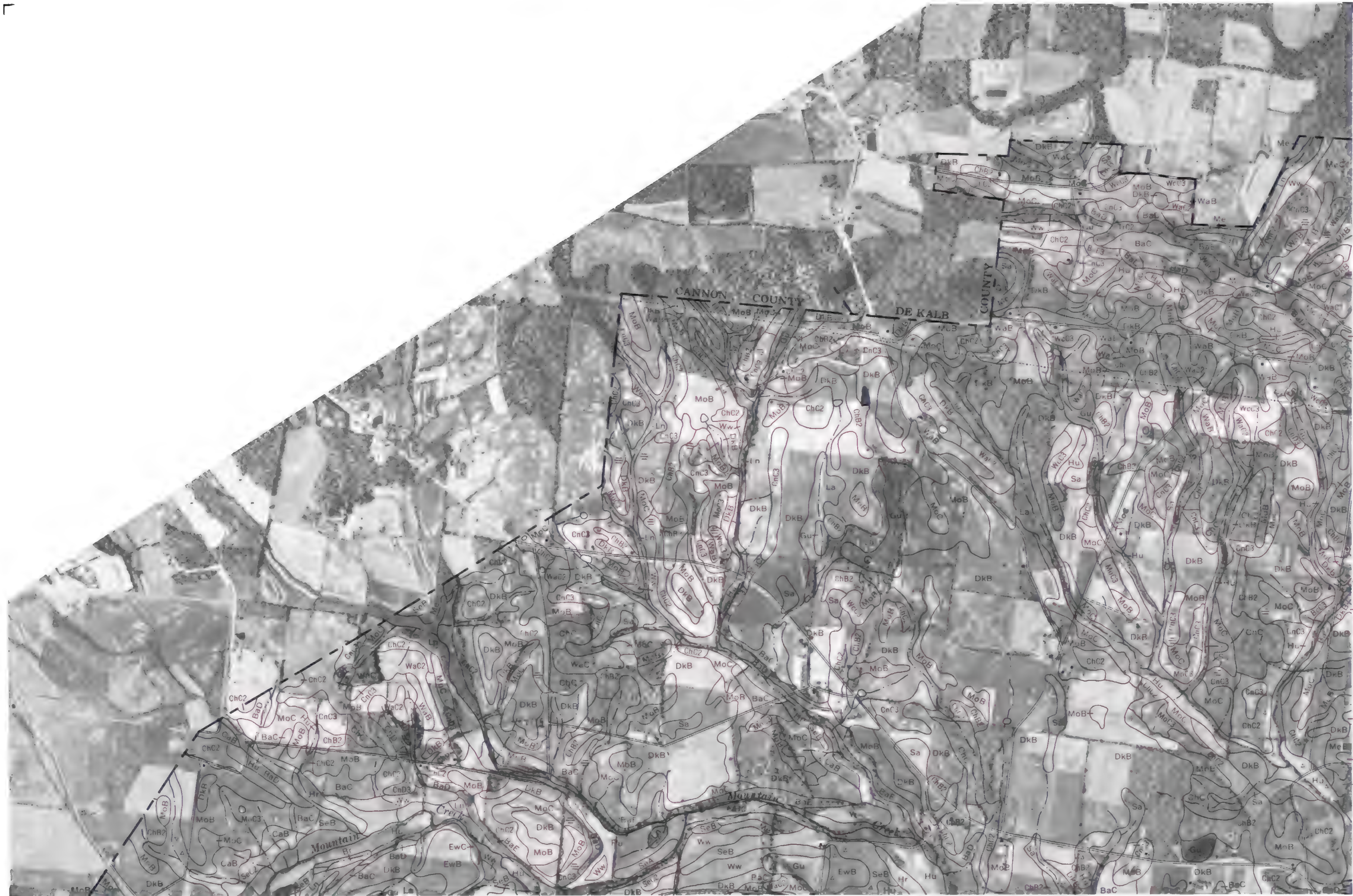
Blowout, wind erosion

Gullies

Indian mound

Soil map constructed 1965 by Cartographic Division, Soil Conservation Service, USDA, from 1959 aerial photographs. Controlled mosaic based on Tennessee plane coordinate system, Lambert conformal conic projection, 1927 North American datum.

1



0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.

2

N

(Joins sheet 1)

(Joins sheet 3)

(Joins sheet 7)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

WARREN COUNTY, TENNESSEE — SHEET NUMBER 3

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

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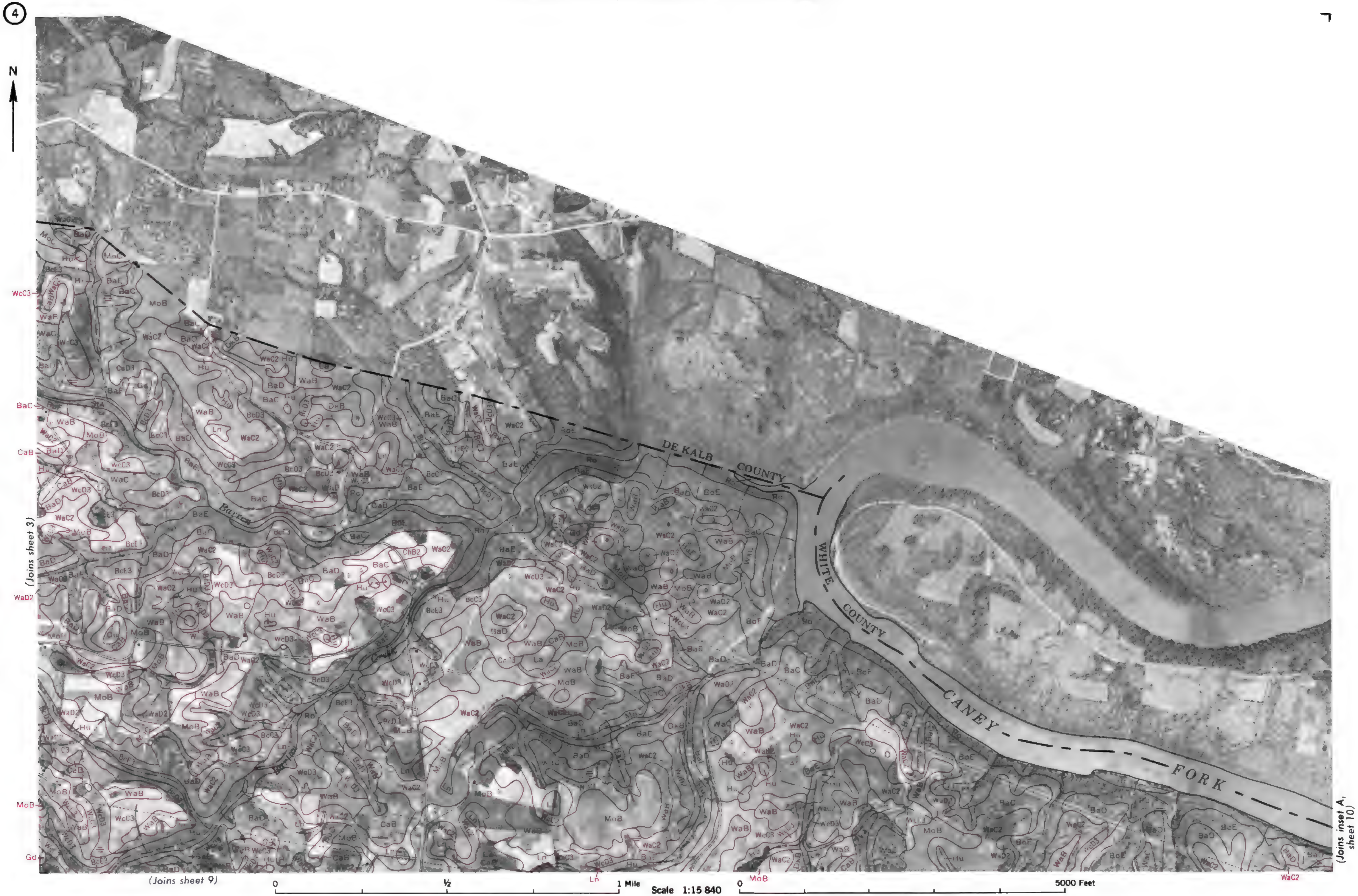
4
N
DE KALB COUNTY
WHITE COUNTY
CANEY FORK
Barren Creek
(Joins sheet 3)
(Joins sheet 9)
(Joins inset A, sheet 10)
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

5

N

(Joins sheet 6)

(Joins sheet 11)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.

6

(Joins sheet 1)

(Joins sheet 5)

(Joins sheet 7)

(Joins sheet 12)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

WARREN COUNTY, TENNESSEE — SHEET NUMBER 7

(Joins sheet 2)

7

N

(Joins sheet 6)

(Joins sheet 8)

(Joins sheet 13)

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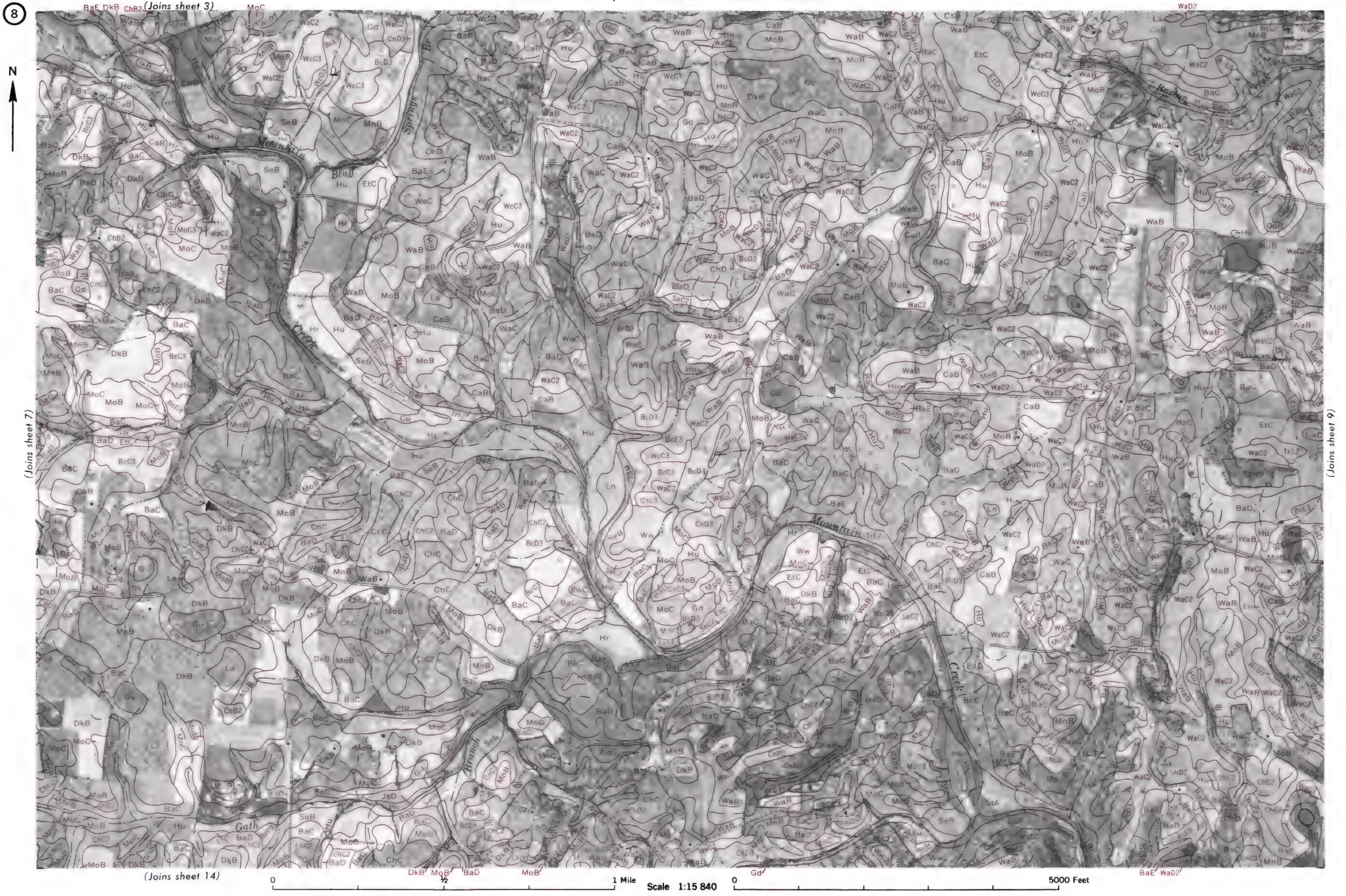
8
N
(Joins sheet 3)
(Joins sheet 7)
(Joins sheet 9)
(Joins sheet 14)
Mountain Creek
Spring Br
Branch
Barren
Gath
Scale 1:15 840
0
½
1 Mile
0
5000 Feet

(Joins sheet 4)

9

(Joins sheet 8)

(Joins sheet 10)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 15)

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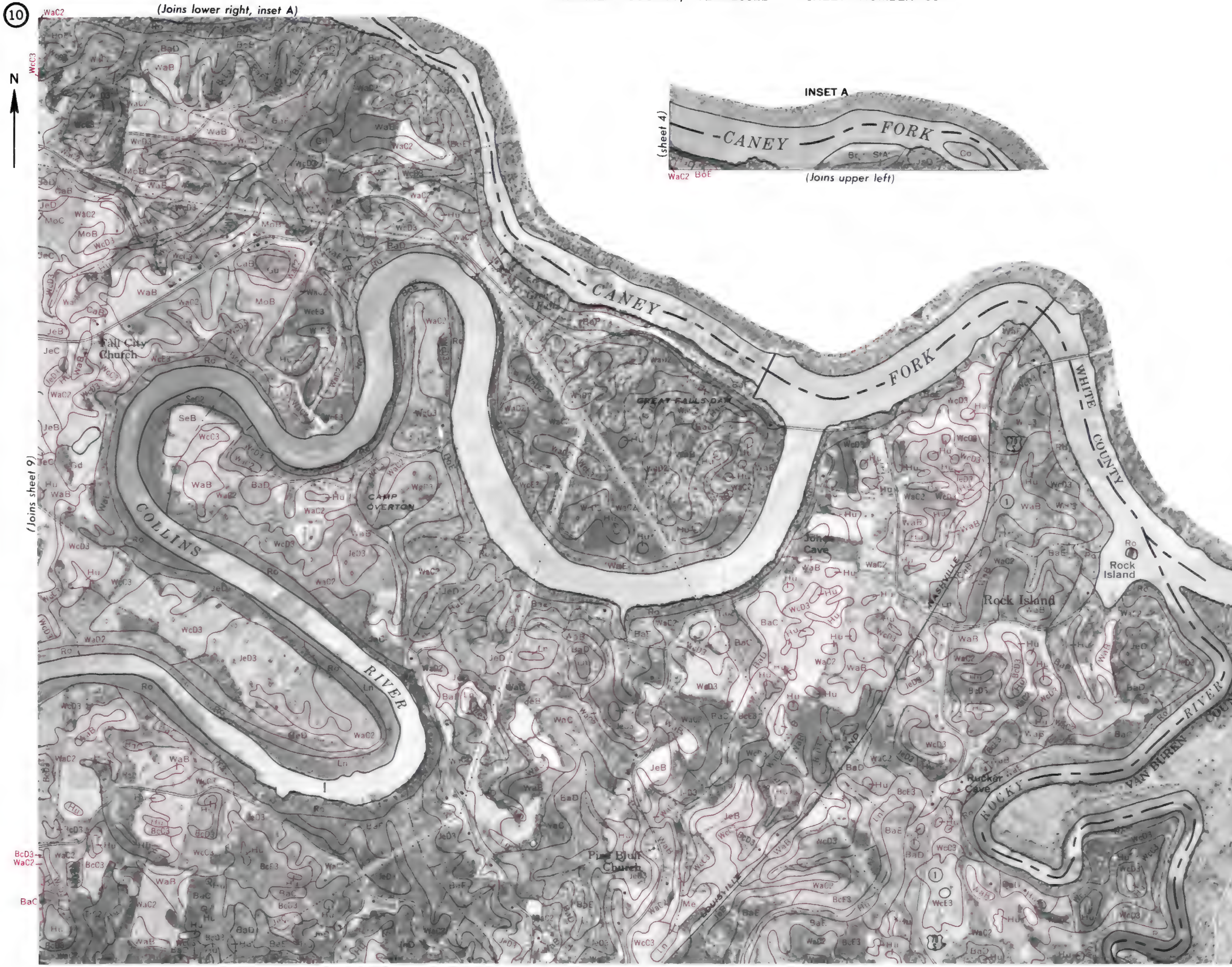
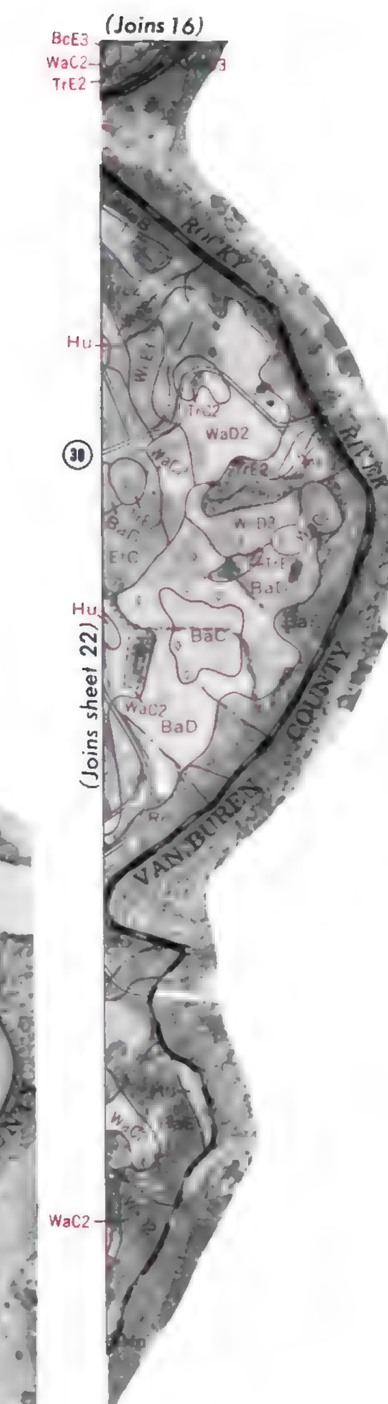


INSET B



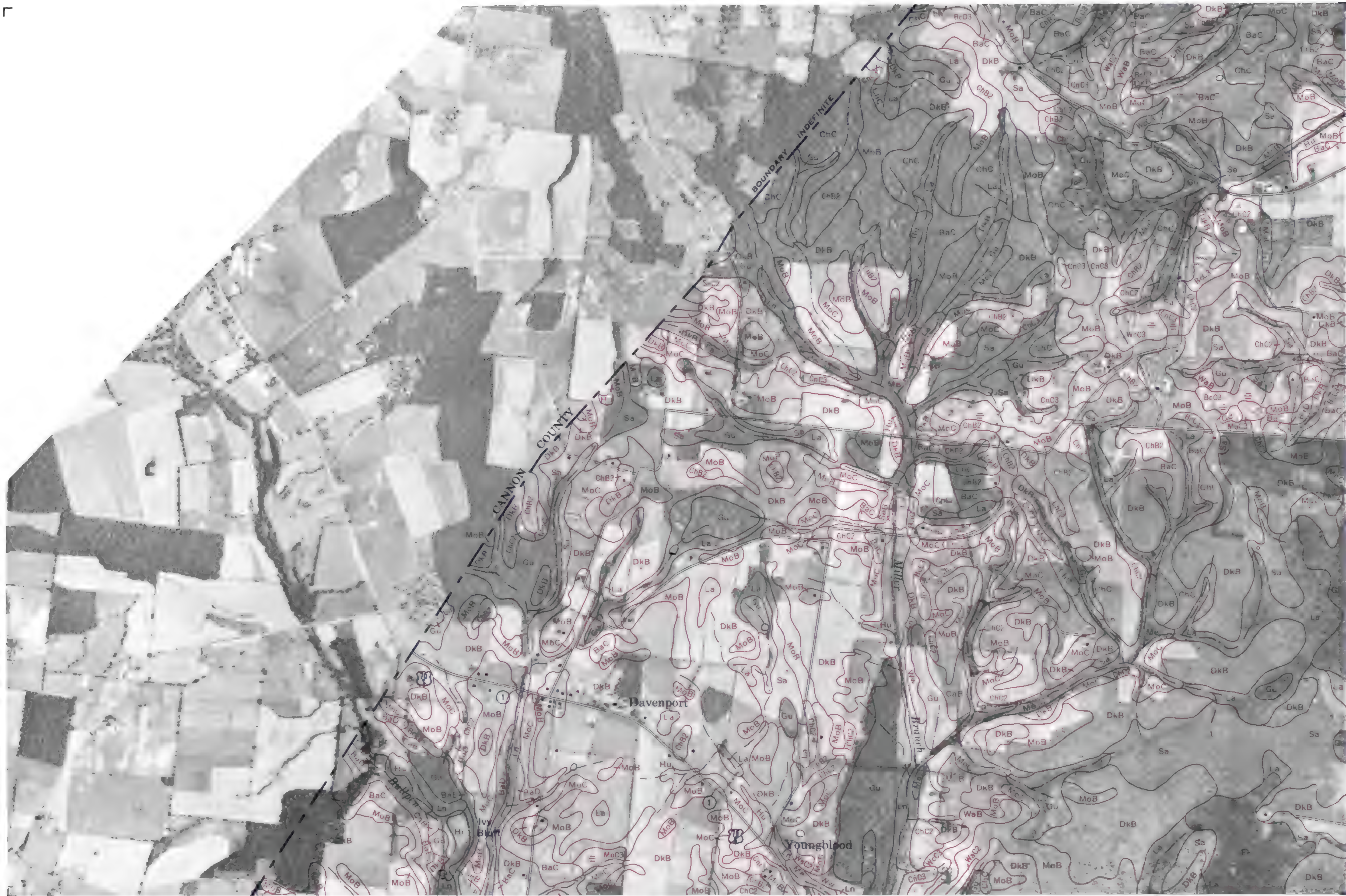
Scale 1:15 840

0 ½ 1 Mile

0 5000 Feet

(11)

(Joins sheet 5)



(Joins sheet 12)

(Joins sheet 17) (Joins sheet 18)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

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WARREN COUNTY, TENNESSEE — SHEET NUMBER 12

13

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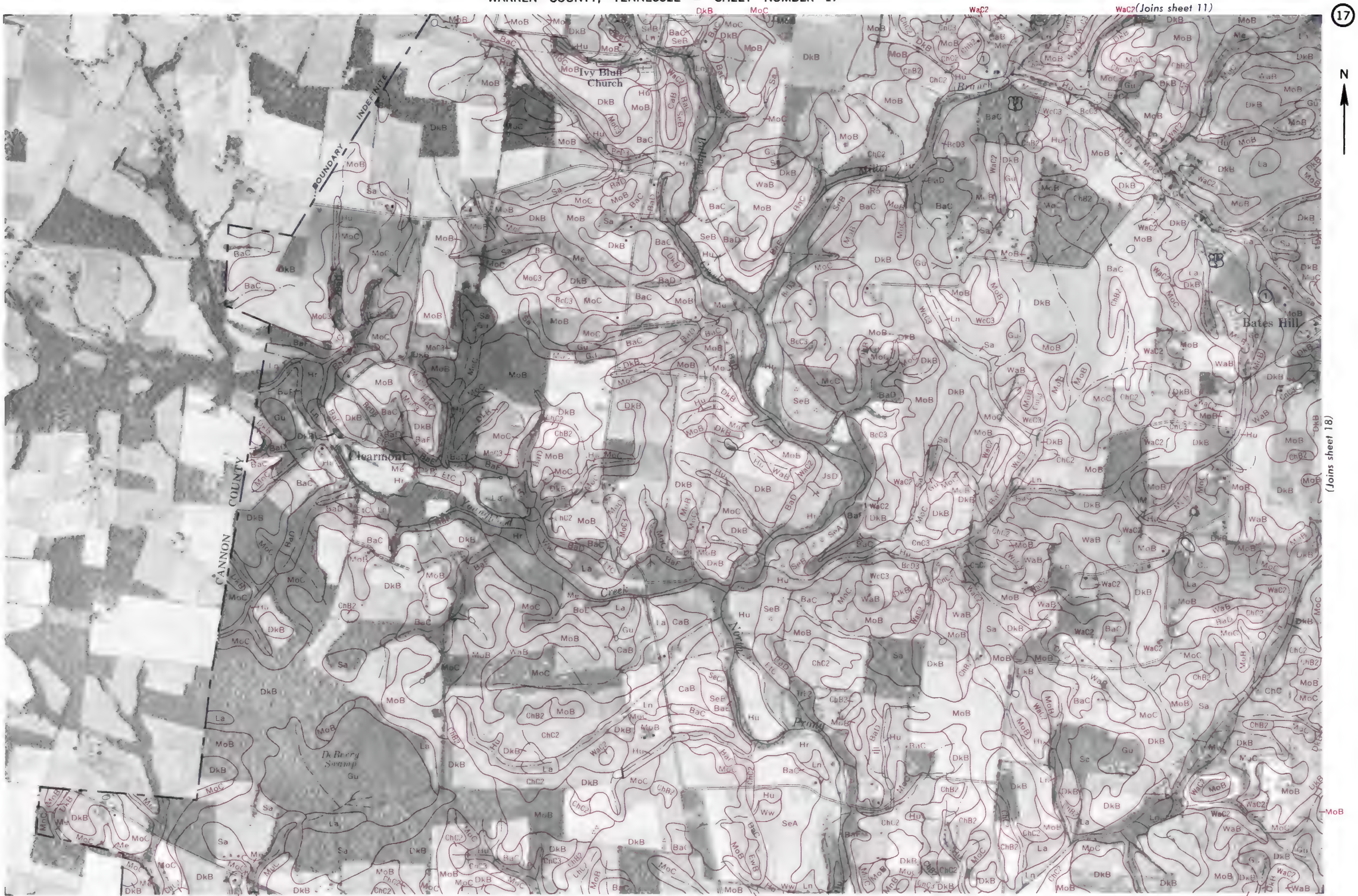
(14)

(Joins sheet 8)

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.


16
(Joins sheet 10)
N
(Joins sheet 15)
(Joins sheet 22)
Campaign Church
Friendship Church
Campaign
Rock Station
Turkeyscratch Mountain
NASHVILLE
LOUISVILLE
VAN BUREN COUNTY
ROCKY RIVER
0
½
1 Mile
Scale 1:15 840
0
5000 Feet



0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

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WARREN COUNTY, TENNESSEE — SHEET NUMBER 18

18

(Joins sheet 11) | (Joins sheet 12)

(Joins sheet 17)

(Joins sheet 19)

(Joins sheet 24)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

WARREN COUNTY, TENNESSEE — SHEET NUMBER 19

(Joins sheet 12) | (Joins sheet 13)

19

(Joins sheet 18)

(Joins sheet 20)

(Joins sheet 25)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.


20
N
(Joins sheet 13)
(Joins sheet 14)
(Joins sheet 19)
(Joins sheet 21)
(Joins sheet 26)
Wayside
Arlington Church
Faulkner Springs
Northside School
Northside Church
Bybee
Charles
COLLINS
RIVER
Scale 1:15 840
0
½
1 Mile
0
5000 Feet

(Joins sheet 14) | (Joins sheet 15)

(Joins sheet 20)

(Joins sheet 22)

(Joins sheet 27)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.

22

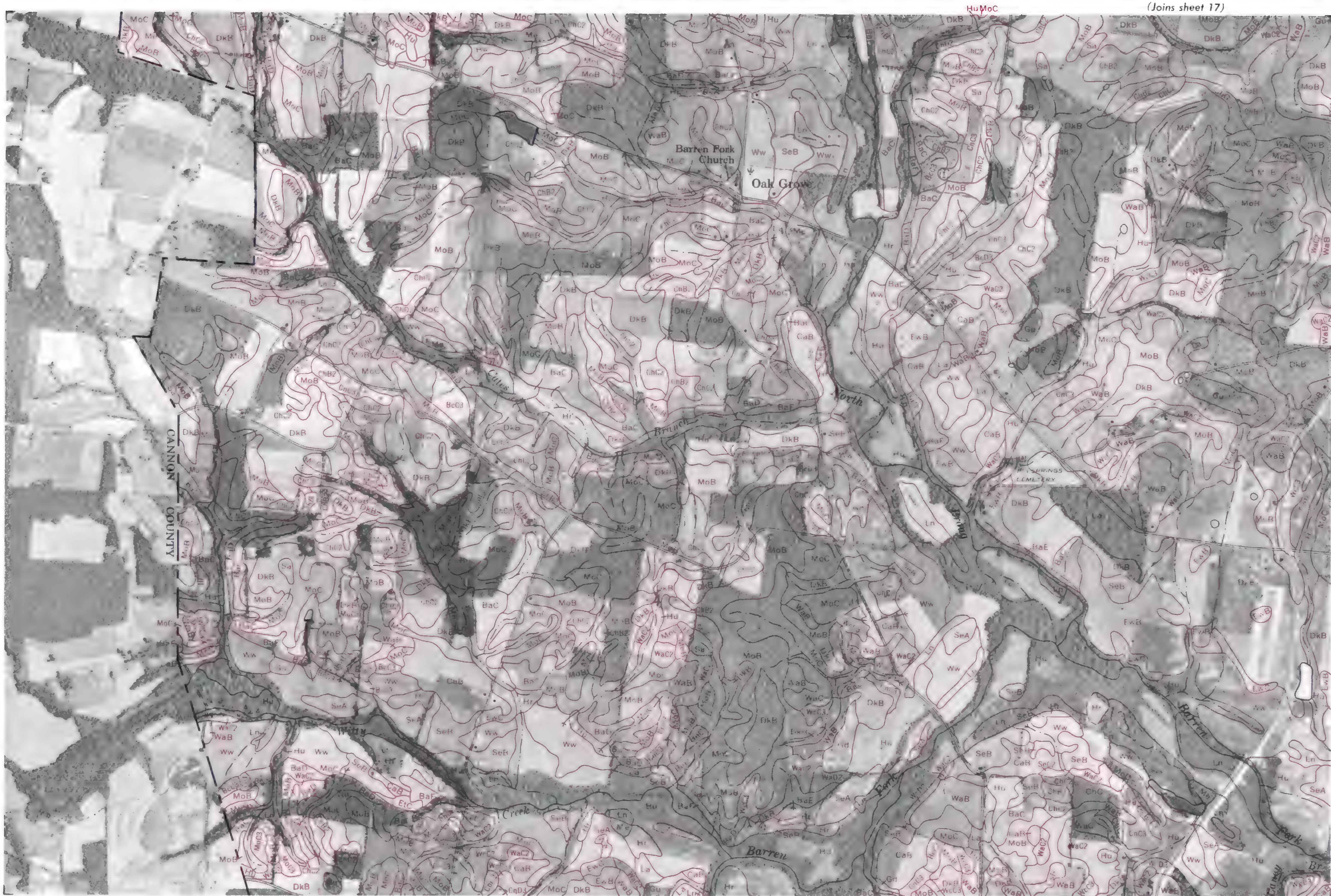
(Joins sheet 15) | (Joins sheet 16)

(Joins sheet 28)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 17)

23



(Joins sheet 24)

(Joins sheet 29)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.

WARREN COUNTY, TENNESSEE — SHEET NUMBER 24

Scale 1:15 840

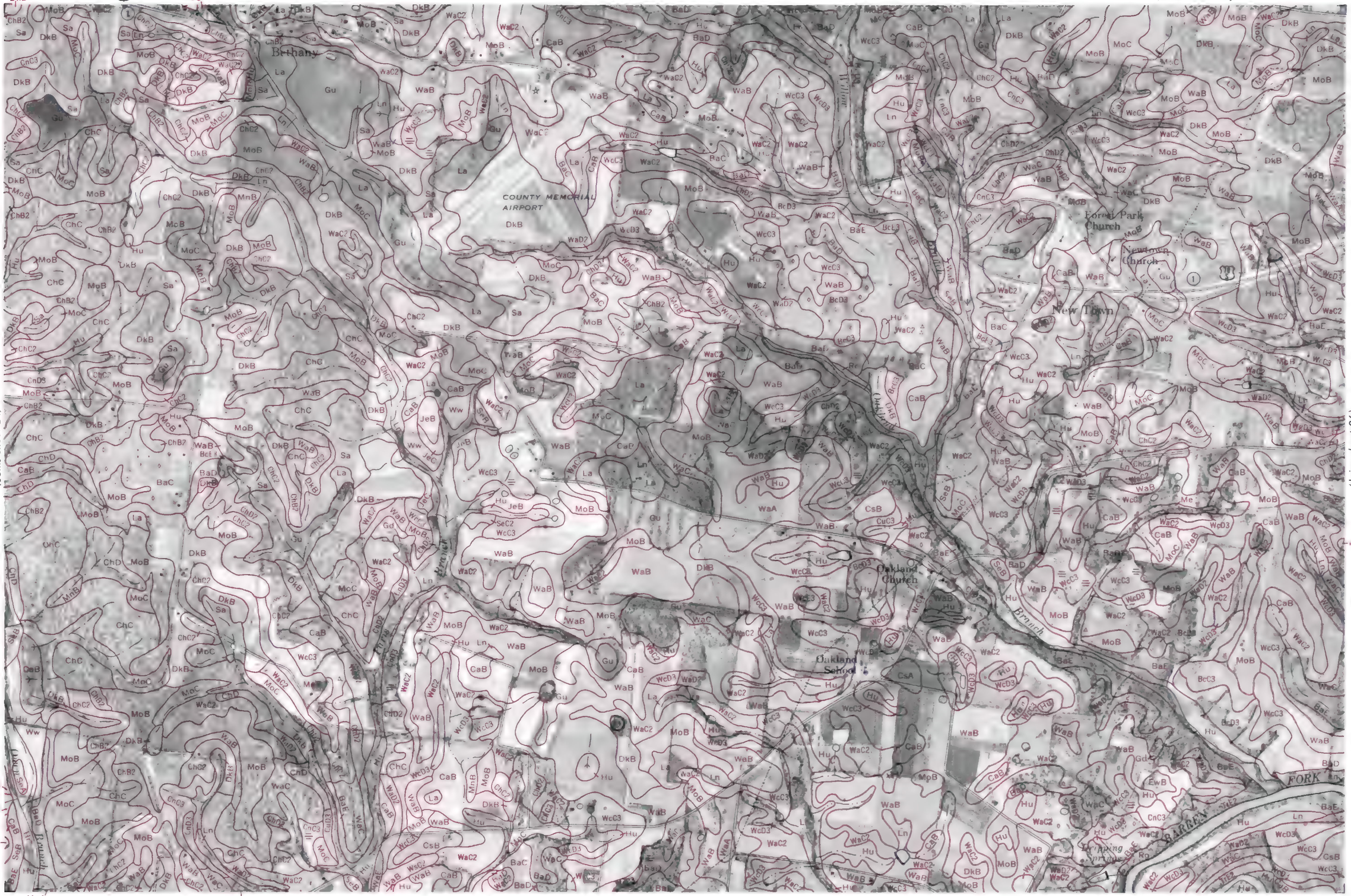
0 ½ 1 Mile

0 5000 Feet

25

(Joins sheet 19)

(Joins sheet 24)



(Joins sheet 26)

(Joins sheet 31)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.

26

(Joins sheet 20)

N

(Joins sheet 25)

(Joins sheet 27)

(Joins sheet 32)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 21)

27

(Joins sheet 26)

(Joins sheet 28)

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.

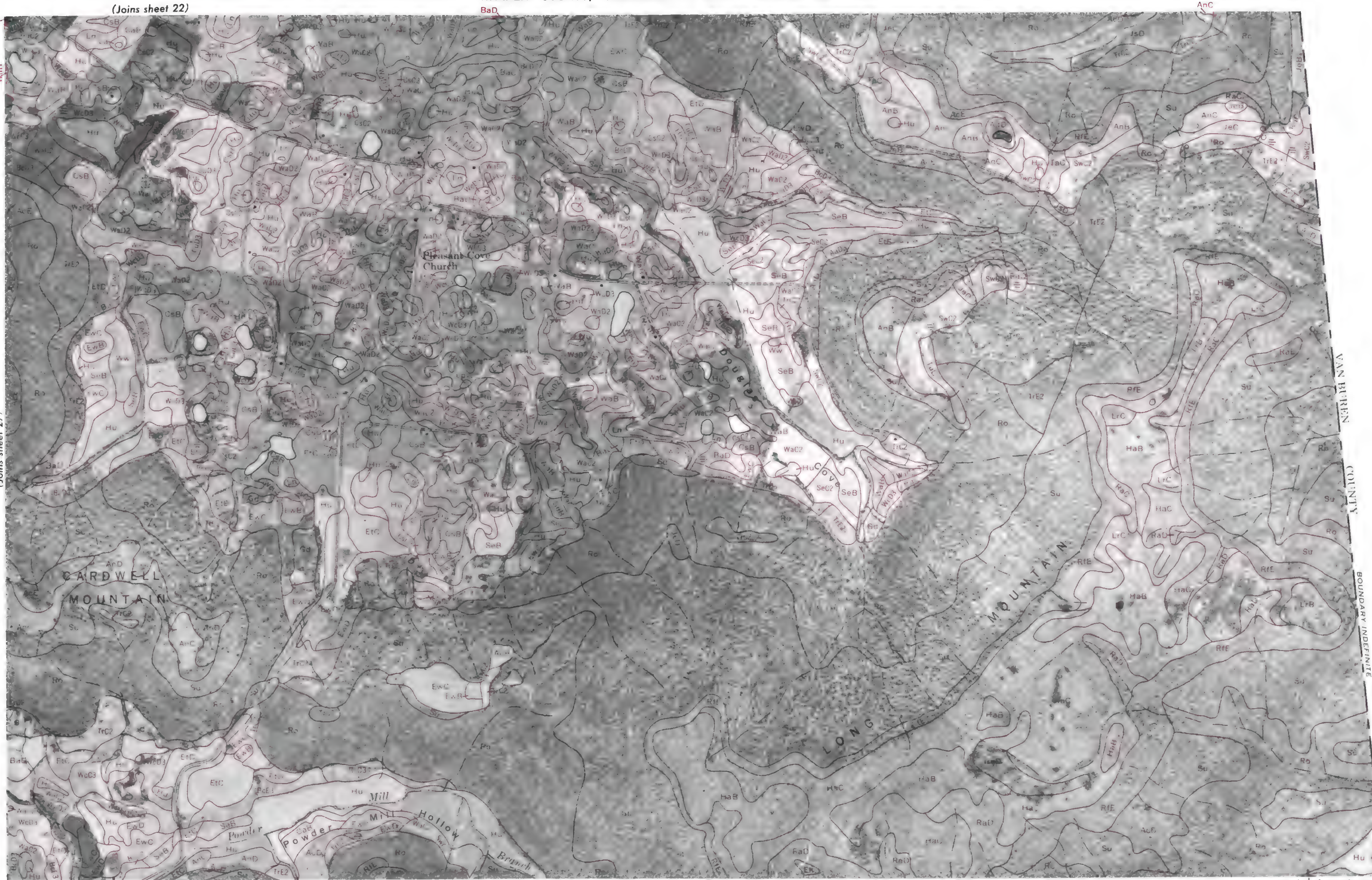
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 33)

WARREN COUNTY, TENNESSEE — SHEET NUMBER 28

28

(Joins sheet 22)



(Joins sheet 34) | (Joins inset, sheet 40)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(29)

(Joins sheet 23)

(Joins sheet 30)

(Joins sheet 35)

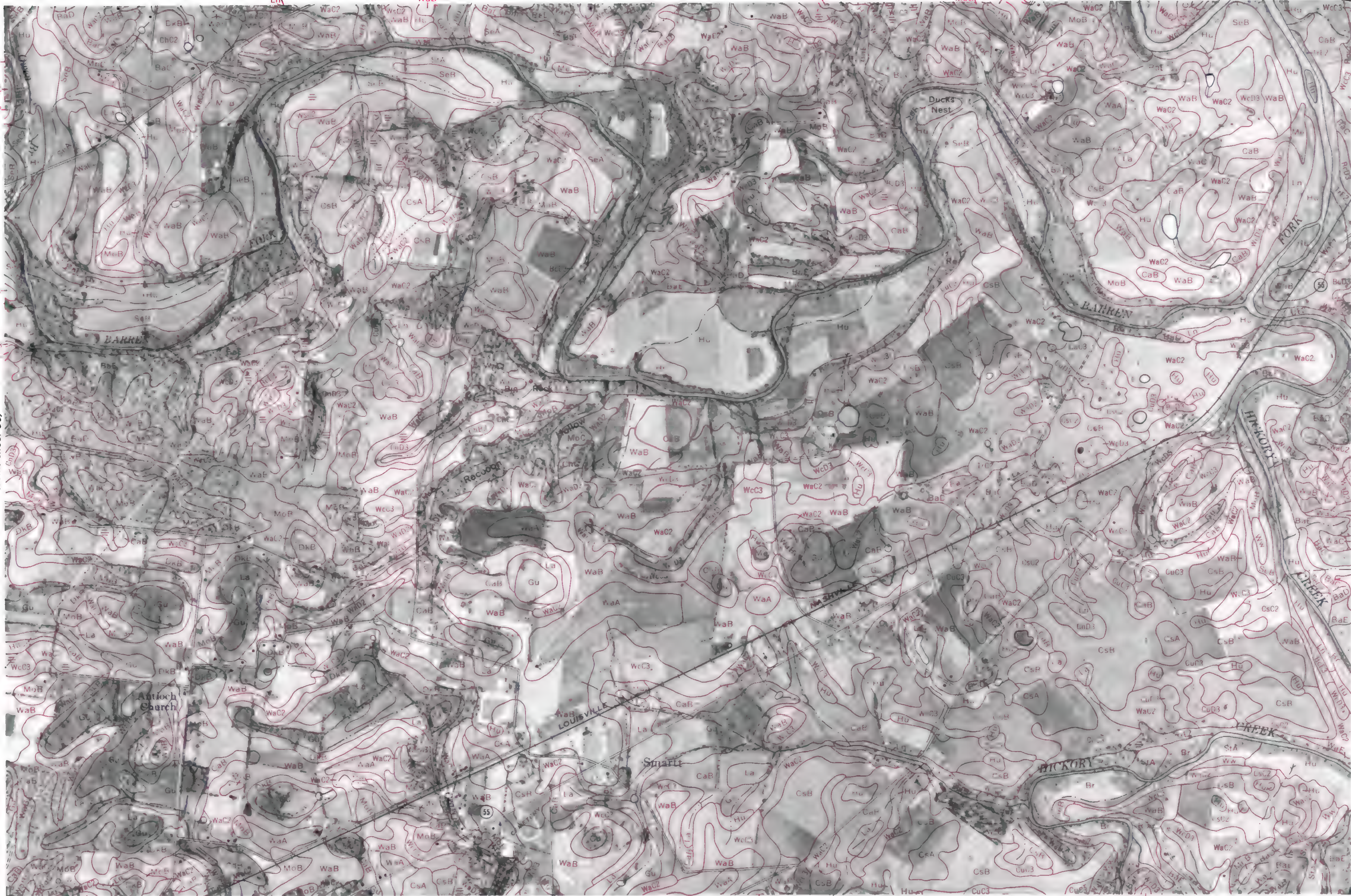
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.


30
(Joins sheet 24)
(Joins sheet 29)
(Joins sheet 31)
(Joins sheet 35) | (Joins sheet 36)
N
Crisp Spring
Barren Fork
Smoot Bluff
Old Friendship Cemetery
5000 Feet
0
1 Mile
½
0
Scale 1:15 840

(Joins sheet 25)

31



(Joins sheet 30)

(Joins sheet 32)

(Joins sheet 36) | (Joins sheet 37)

5000 Feet

0

Scale 1:15 840

1 Mile

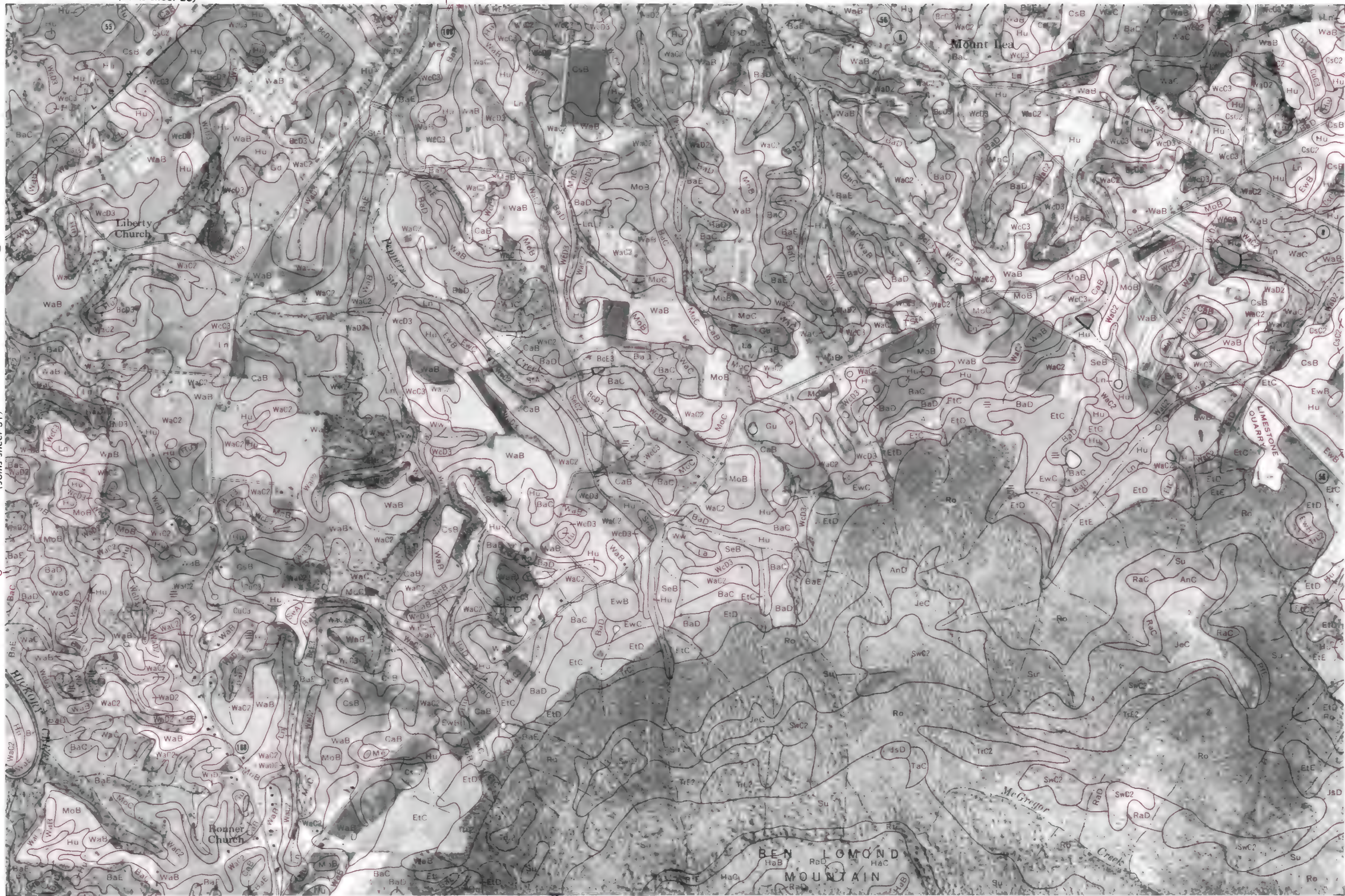
½

0

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.

WARREN COUNTY, TENNESSEE — SHEET NUMBER 32

(Joins sheet 26)



(Joins sheet 31)

(Joins sheet 33)

(Joins sheet 37) | (Joins sheet 38)

5000 Feet
0
Scale 1:15 840
1 Mile
½
0

WARREN COUNTY, TENNESSEE — SHEET NUMBER 33

(Joins sheet 27)

(Joins sheet 32)

(Joins sheet 34)

(Joins sheet 38) | (Joins sheet 39)

5000 Feet
0
Scale 1:15 840
1 Mile
½
0

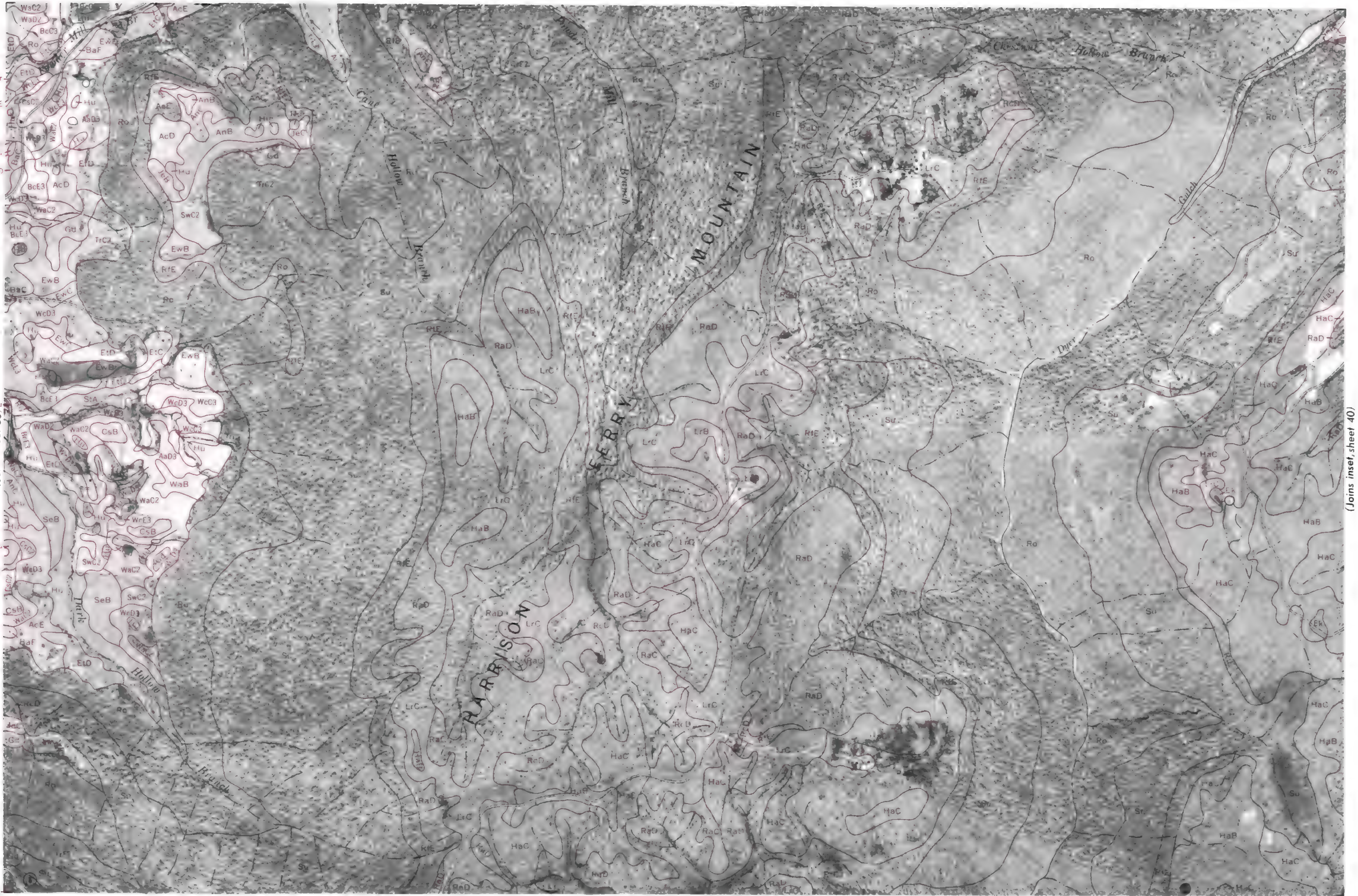
This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.

34

N

(Joins sheet 28)

(Joins sheet 33)



(Joins inset, sheet 40)

(Joins sheet 39) | (Joins sheet 40)

5000 Feet
0
Scale 1:15 840
1 Mile
½
0

(Joins sheet 29) | (Joins sheet 30)

(Joins sheet 36)

(Joins sheet 41)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.

WARREN COUNTY, TENNESSEE — SHEET NUMBER 36

(Joins sheet 30) | (Joins sheet 31)

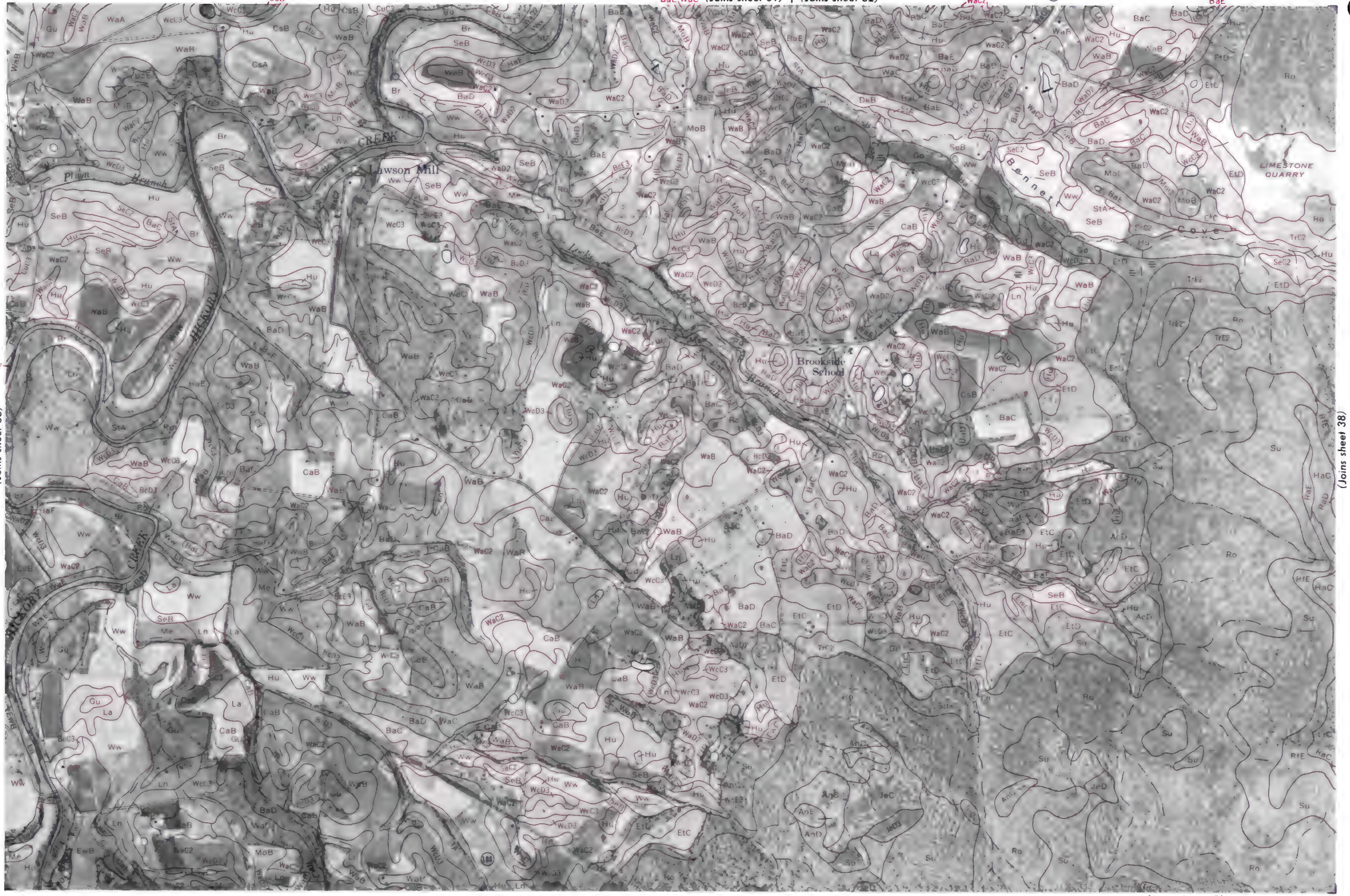
(Joins sheet 35)

(Joins sheet 37)

(Joins sheet 42)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 31) | (Joins sheet 32)



0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

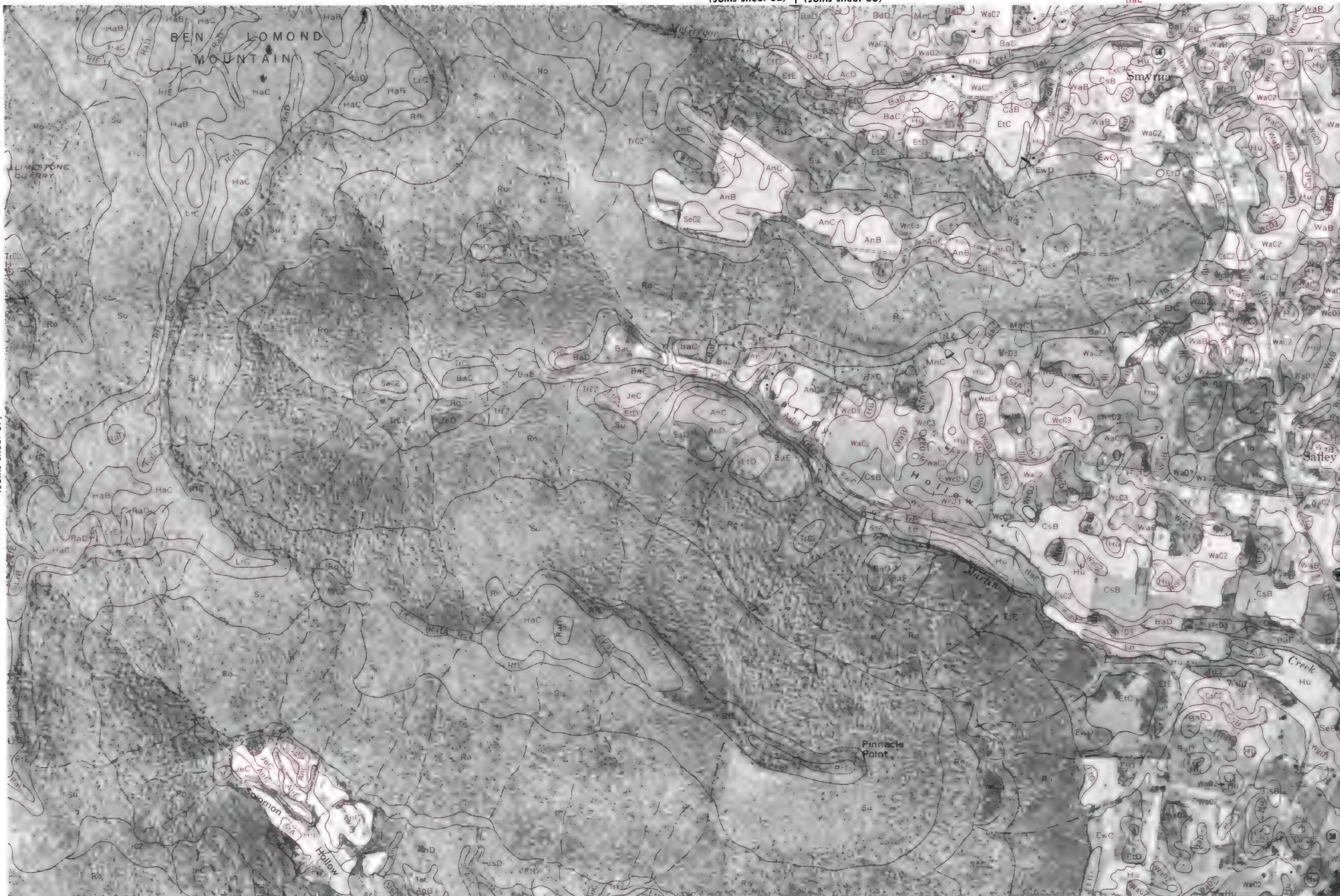
This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.

(38)

WARREN COUNTY, TENNESSEE — SHEET NUMBER 38

(Joins sheet 32) | (Joins sheet 33)

(Joins sheet 37)



(Joins sheet 39)

(Joins sheet 44)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 33) | (Joins sheet 34)

39

(Joins sheet 38)

(Joins sheet 40)

(Joins sheet 45)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.

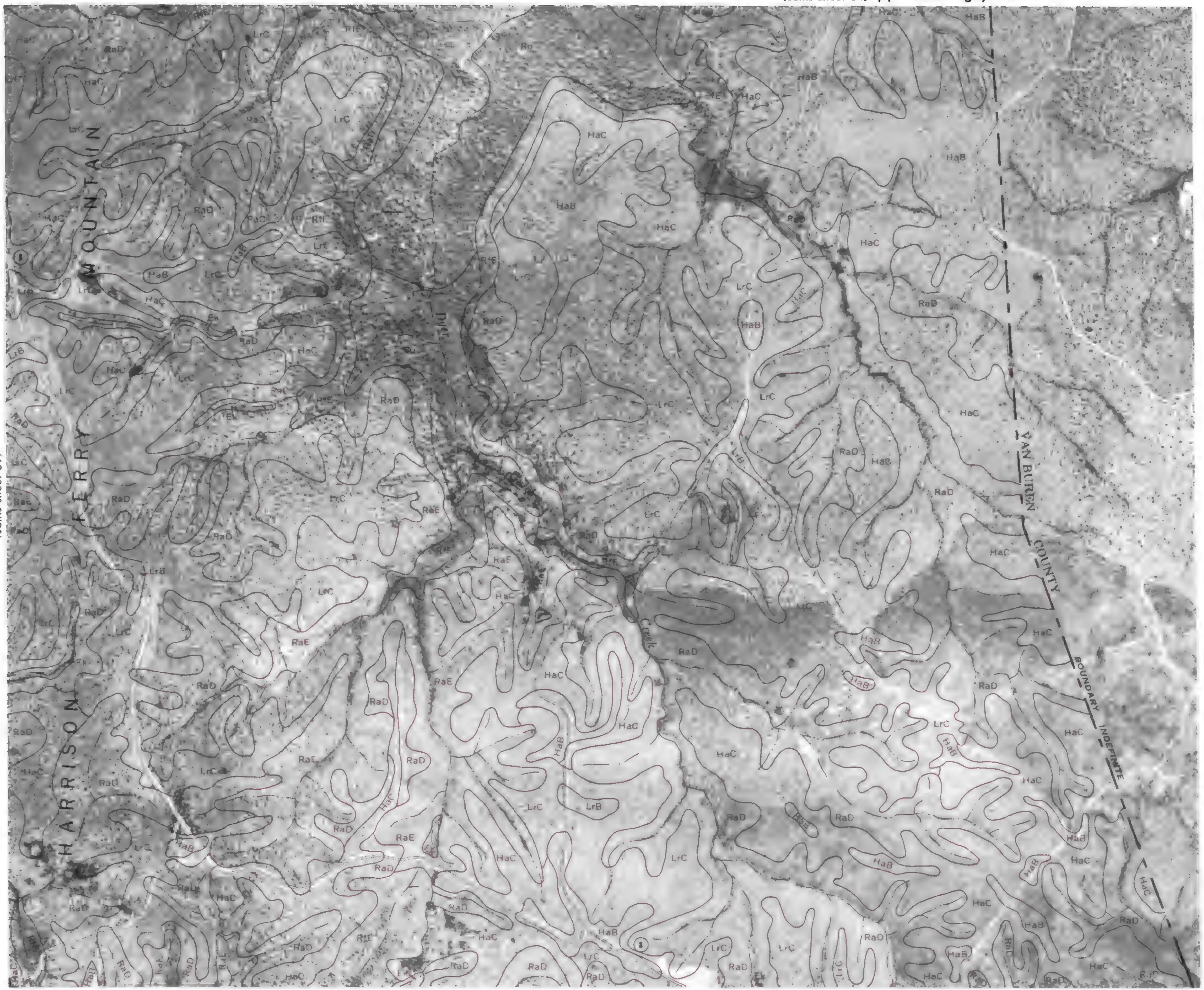
WARREN COUNTY, TENNESSEE — SHEET NUMBER 40

40

N

(Joins sheet 34) | (Joins lower right)

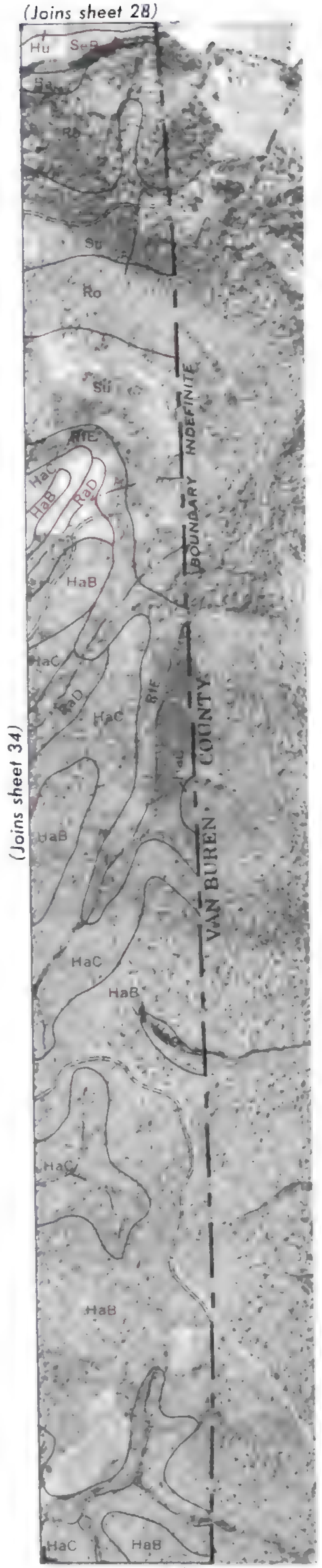
(Joins sheet 39)



(Joins sheet 46)

(Joins sheet 28)

(Joins sheet 34)

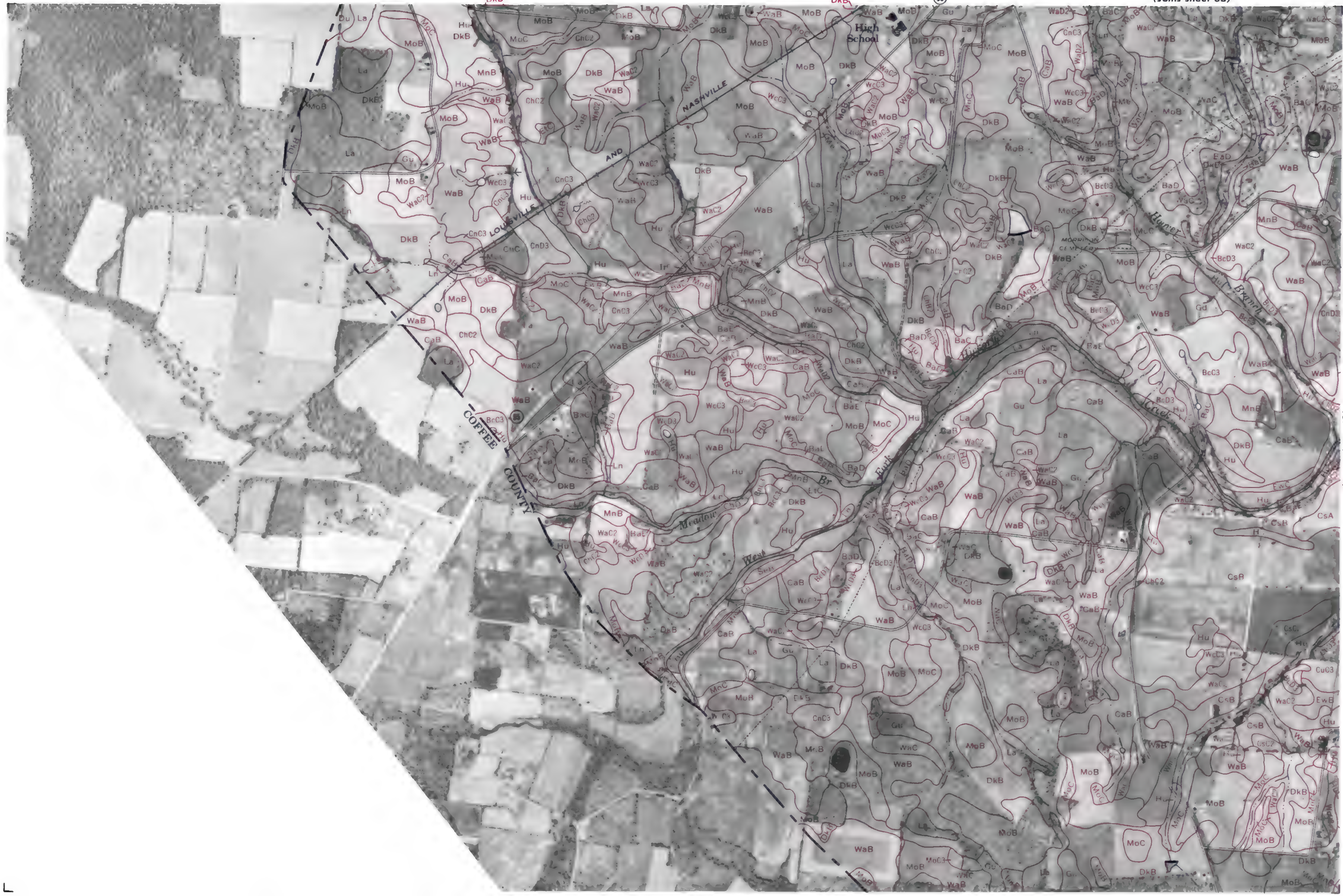


(Joins upper left)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 35)

41



(Joins sheet 42)

(Joins sheet 47)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.

WARREN COUNTY, TENNESSEE — SHEET NUMBER 42

42

(Joins sheet 36)

N

(Joins sheet 41)

(Joins sheet 43)

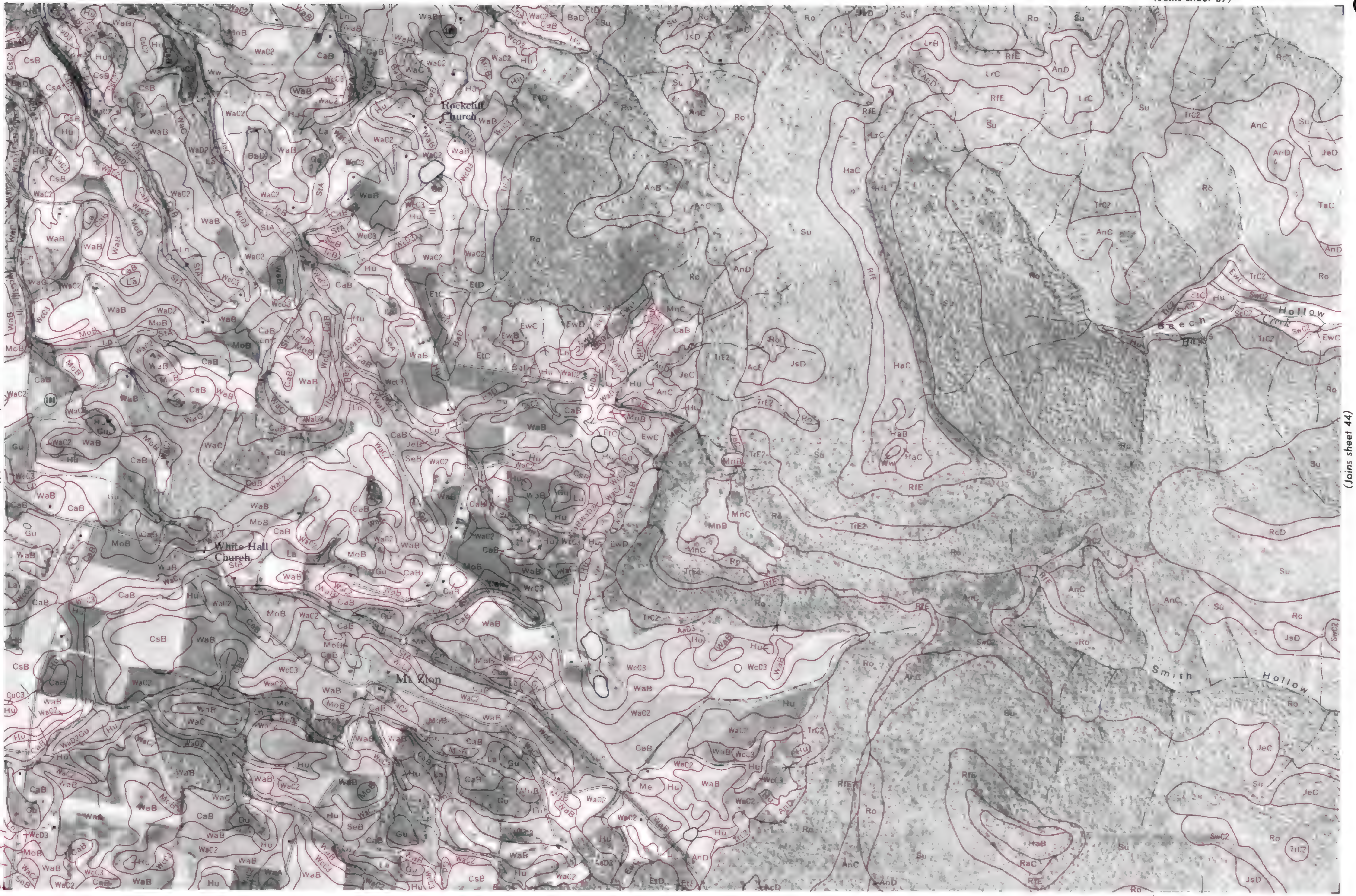
(Joins sheet 48)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 37)

43

N



(Joins sheet 42)

(Joins sheet 44)

(Joins sheet 49)

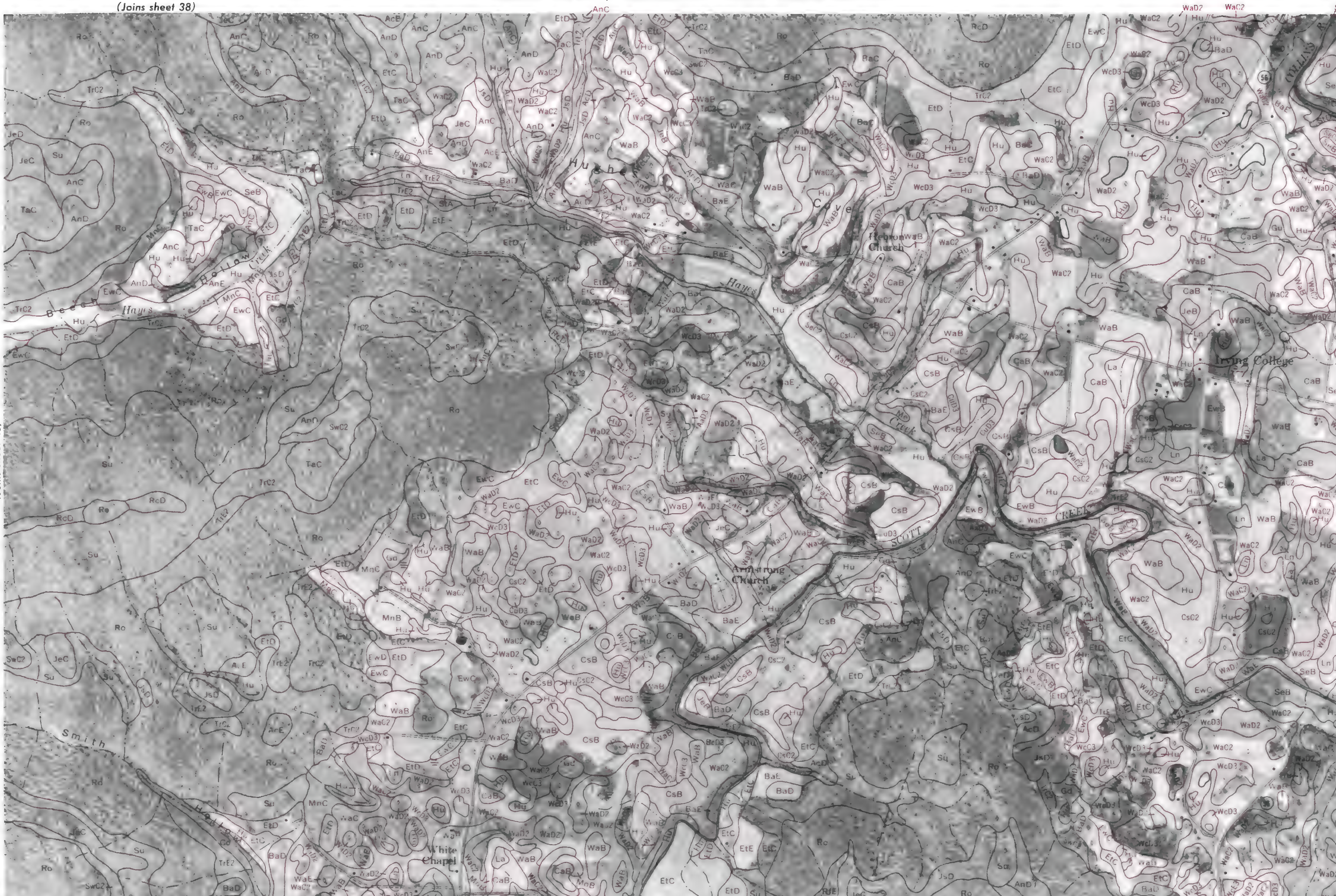
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.

N

(Joins sheet 38)

(Joins sheet 43)



(Joins sheet 45)

(Joins sheet 50)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 39)

45

(Joins sheet 44)

(Joins sheet 46)

(Joins sheet 51)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

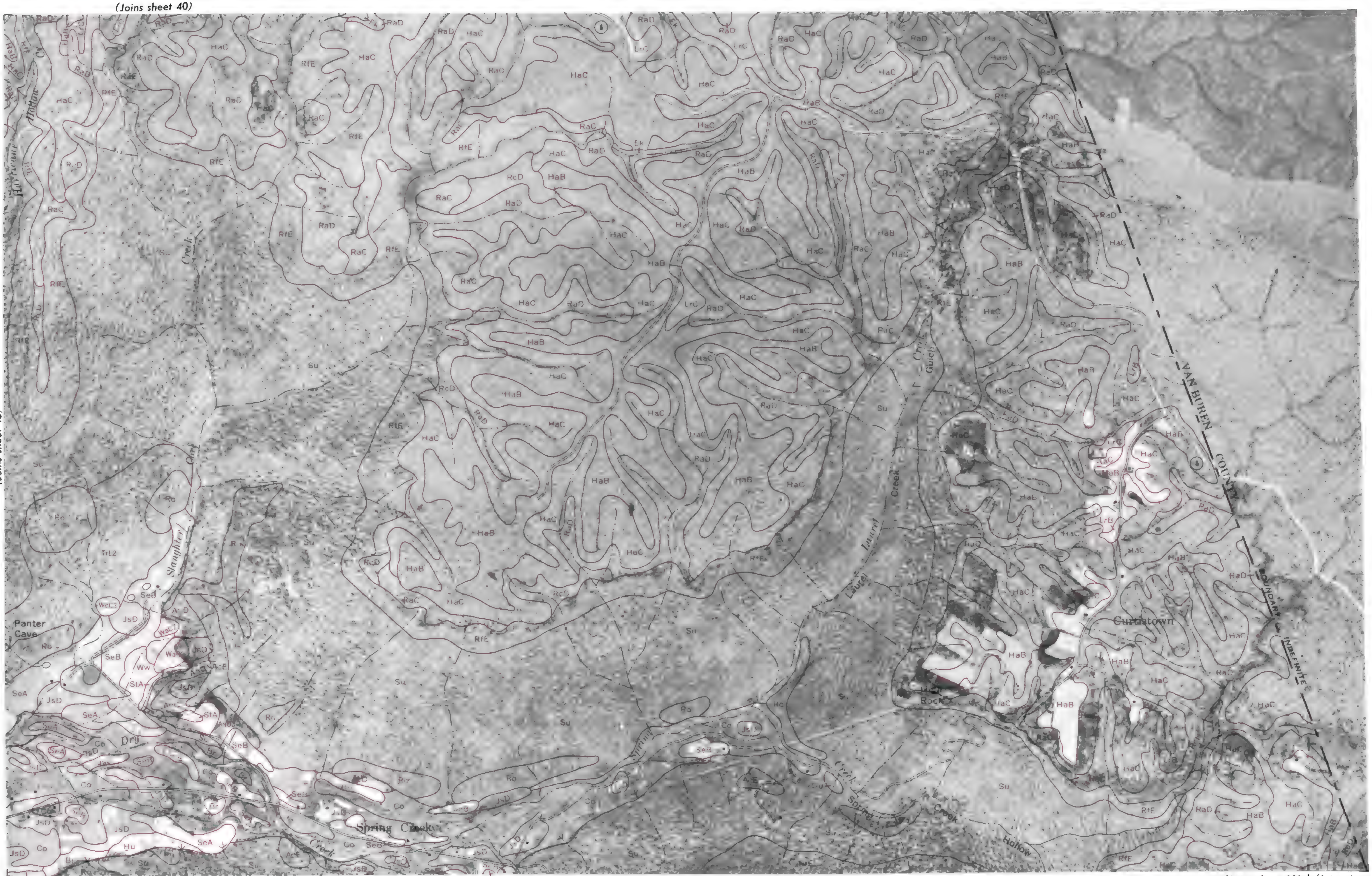
This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.

46

(Joins sheet 40)

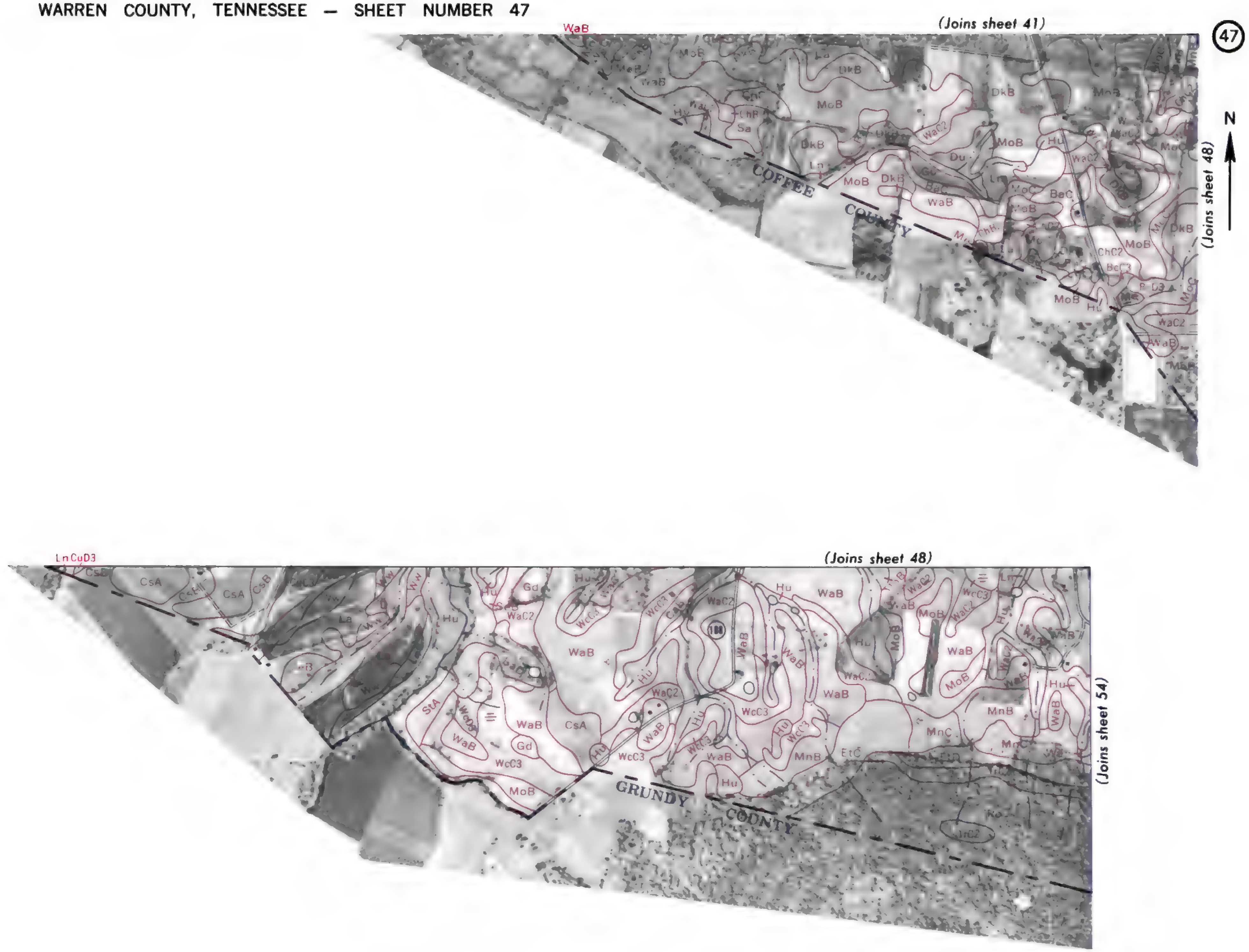
N

(Joins sheet 45)



0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 52) | (Joins sheet 53)



This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(48)

(Joins sheet 42)

(Joins sheet 47)

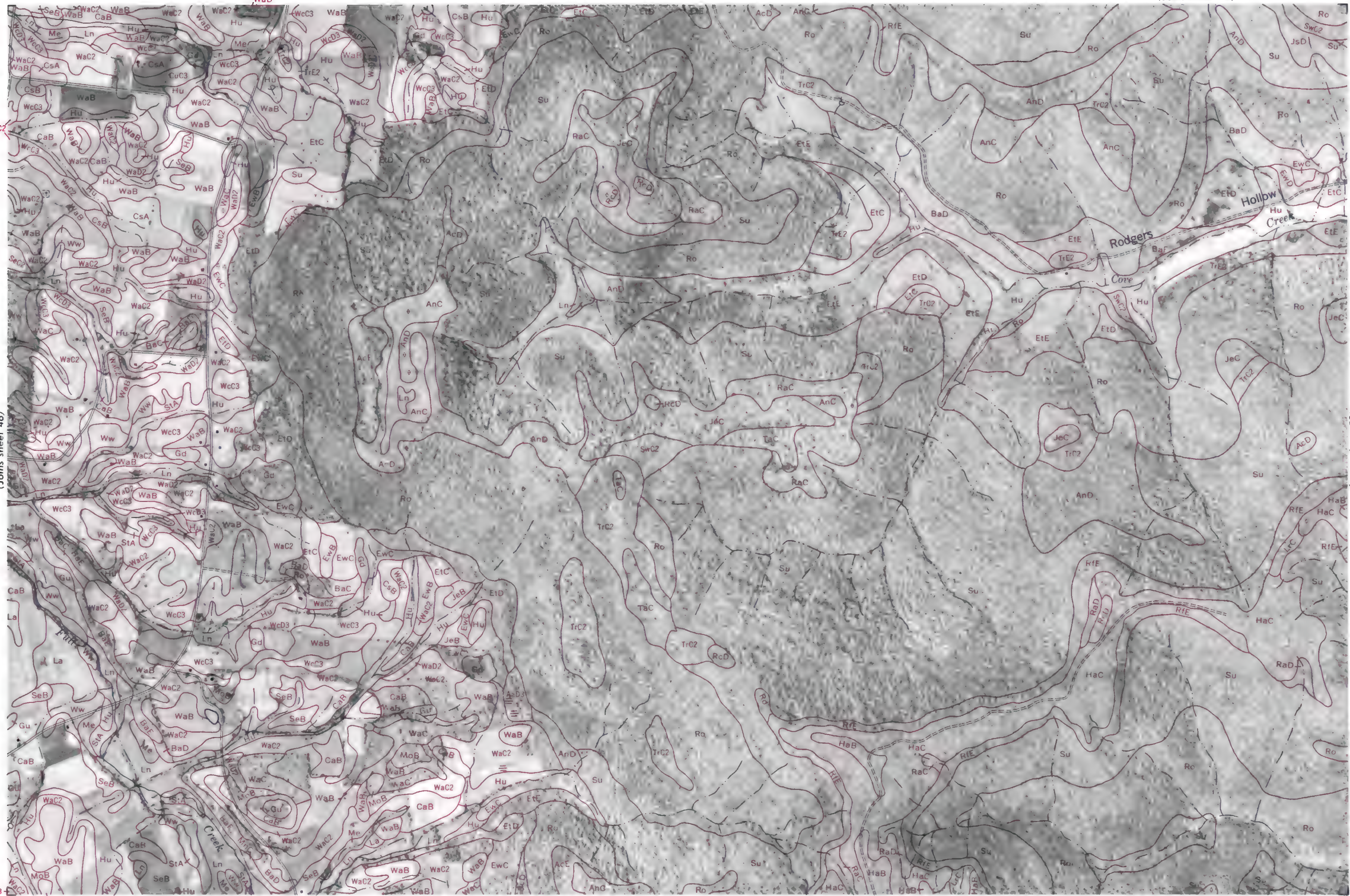
(Joins sheet 49)

(Joins sheet 47)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 43)

(Joins sheet 48)



(Joins sheet 50)

(Joins sheet 54)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.

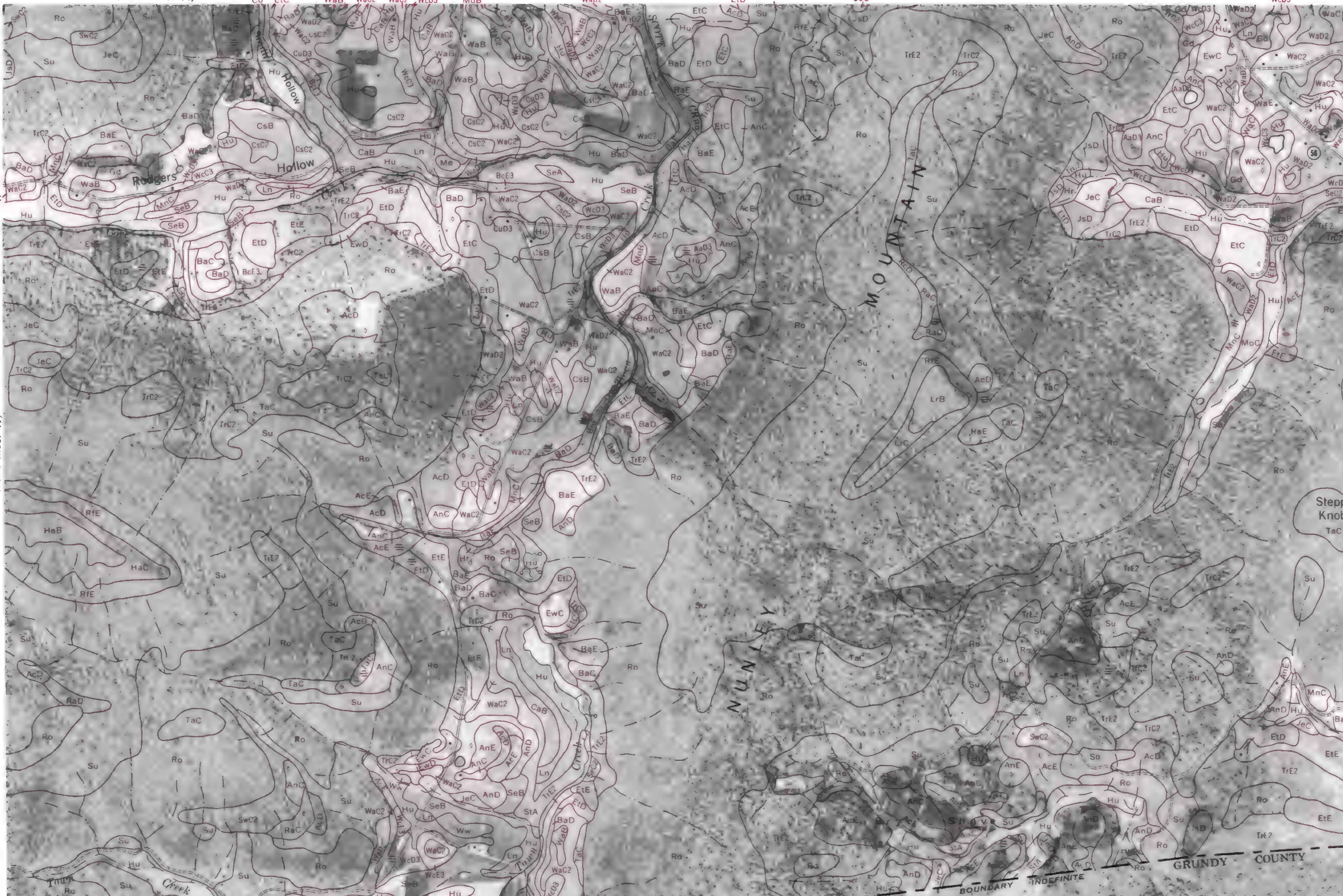
WARREN COUNTY, TENNESSEE — SHEET NUMBER 50

50

(Joins sheet 44)

N

(Joins sheet 49)



(Joins sheet 51)

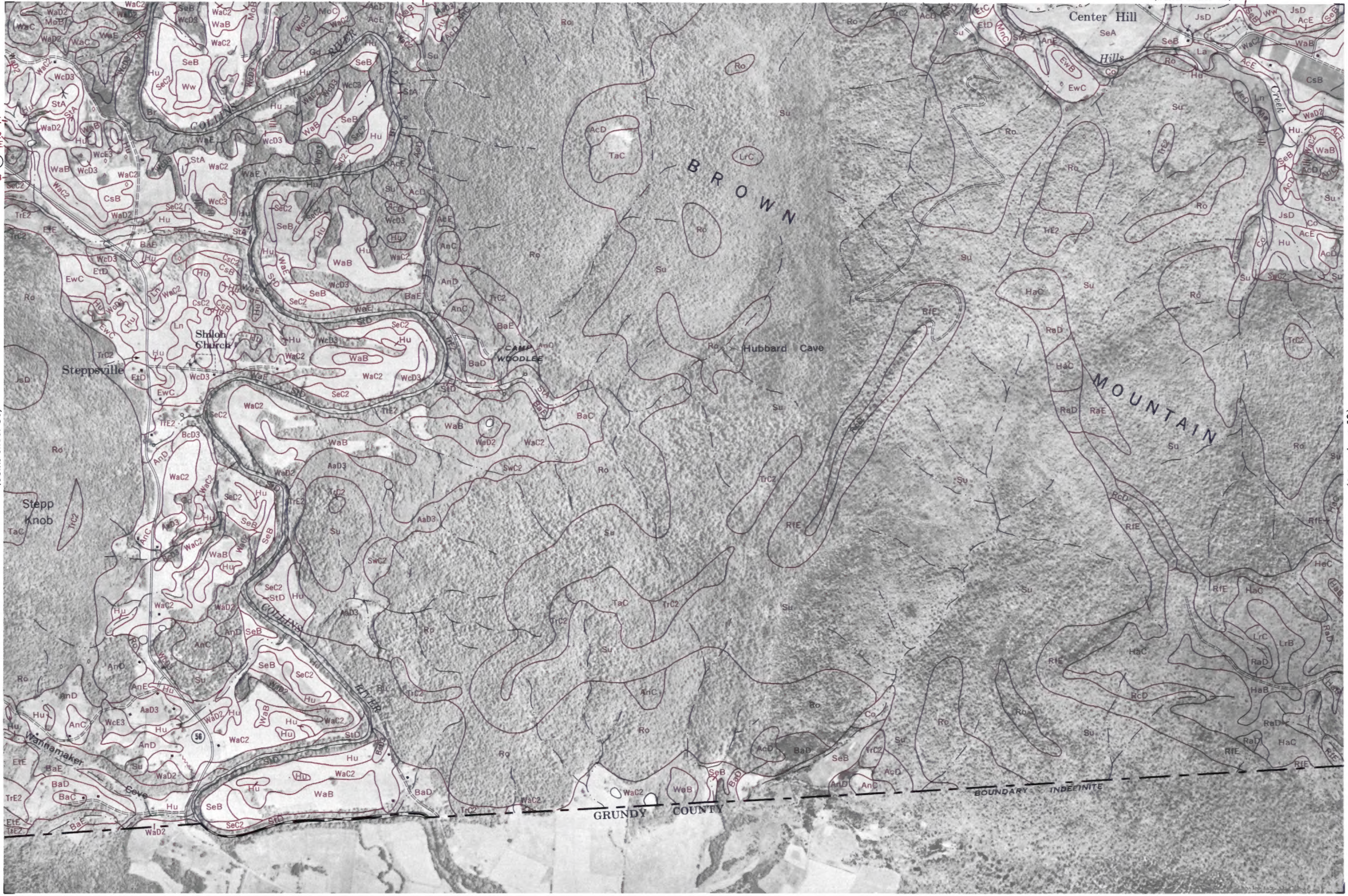
(Joins inset, sheet 54)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

51

(Joins sheet 45)

(Joins sheet 50)

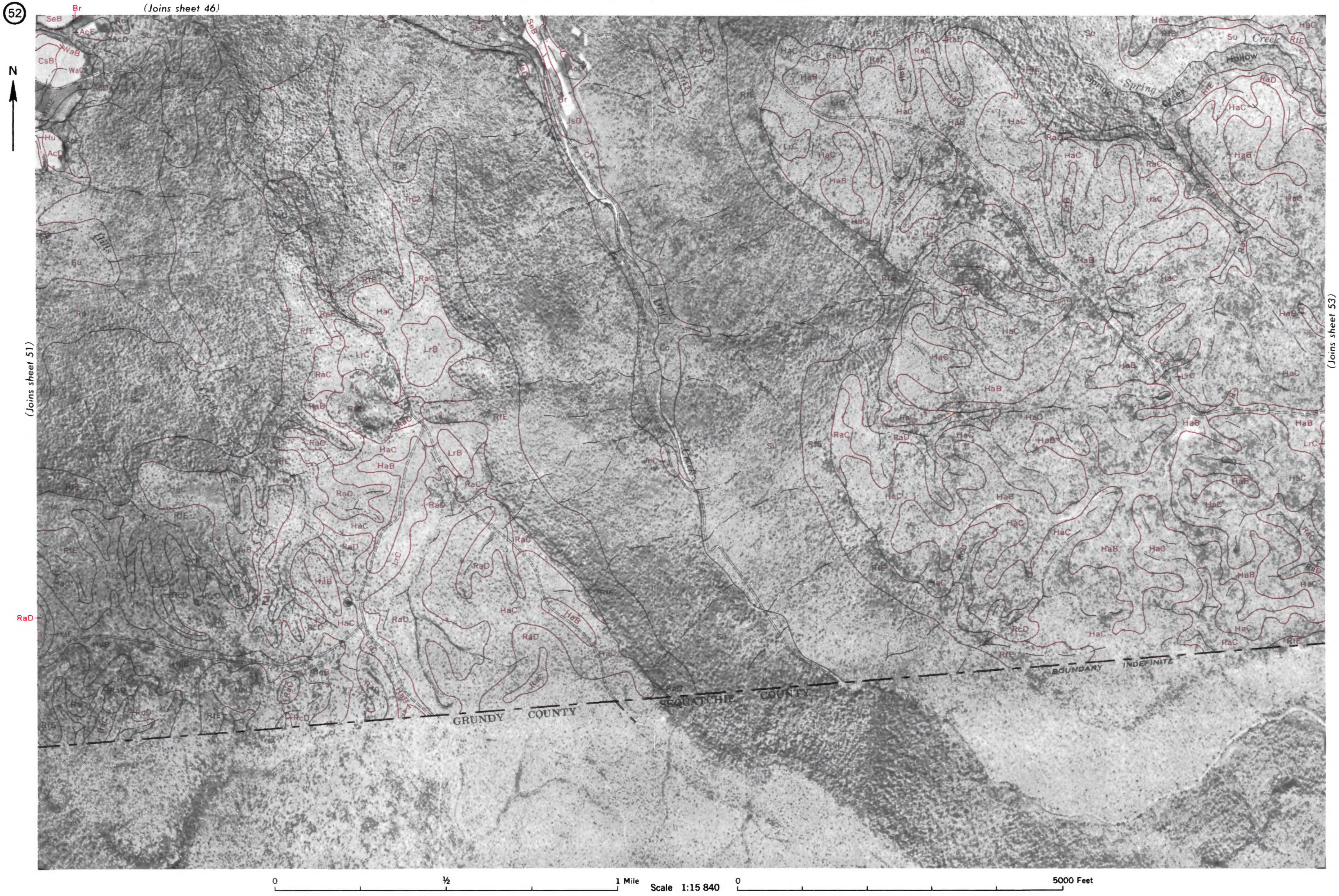


(Joins sheet 52)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.

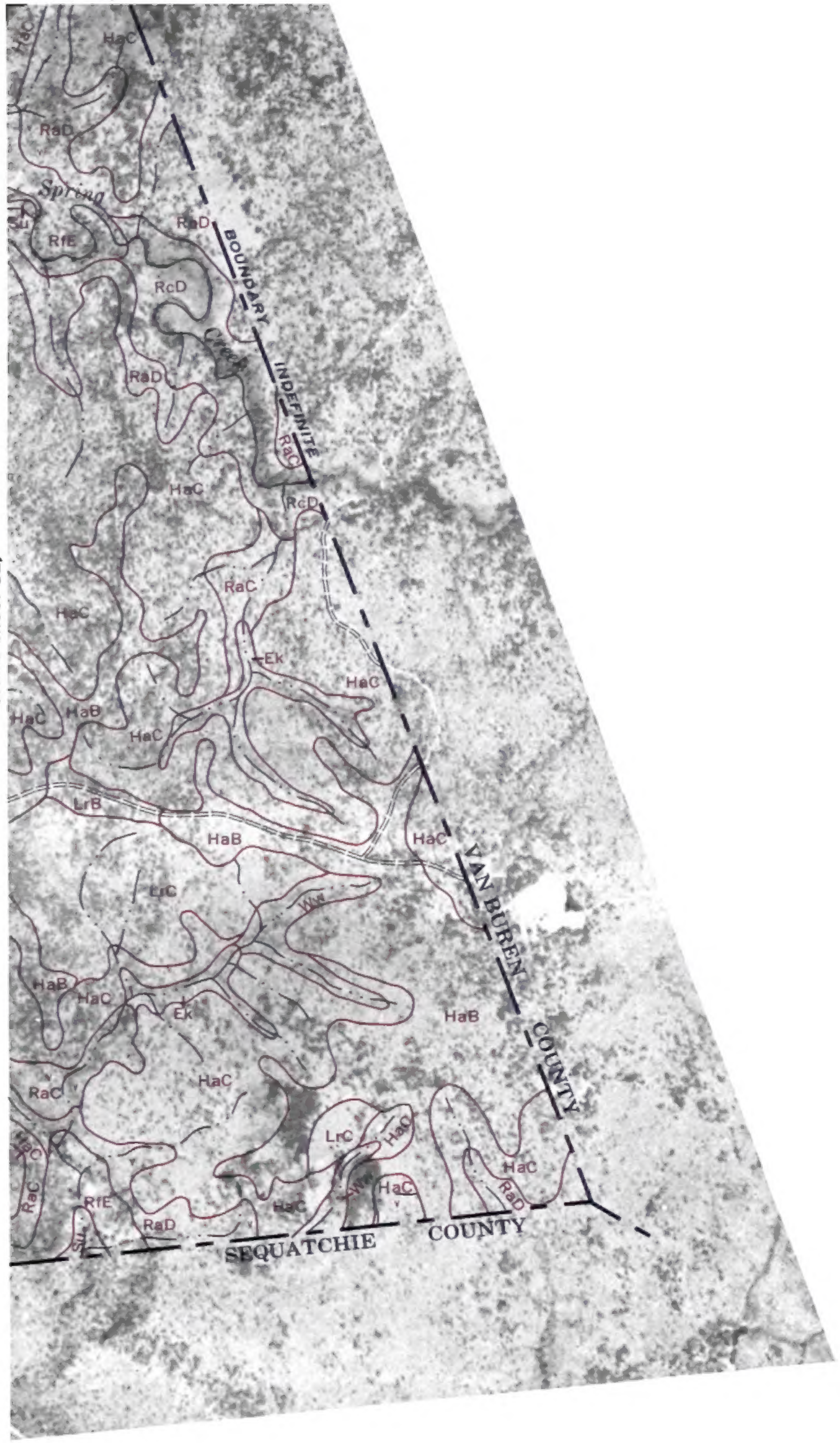
52


(Joins sheet 46)
(Joins sheet 51)
(Joins sheet 53)
N
GRUNDY COUNTY
SEQUATCHIE COUNTY
BOUNDARY INDEFINITE
Spring Creek
Hollow
Creek
Dry
RaD
Scale 1:15 840
0
½
1 Mile
0
5000 Feet

N

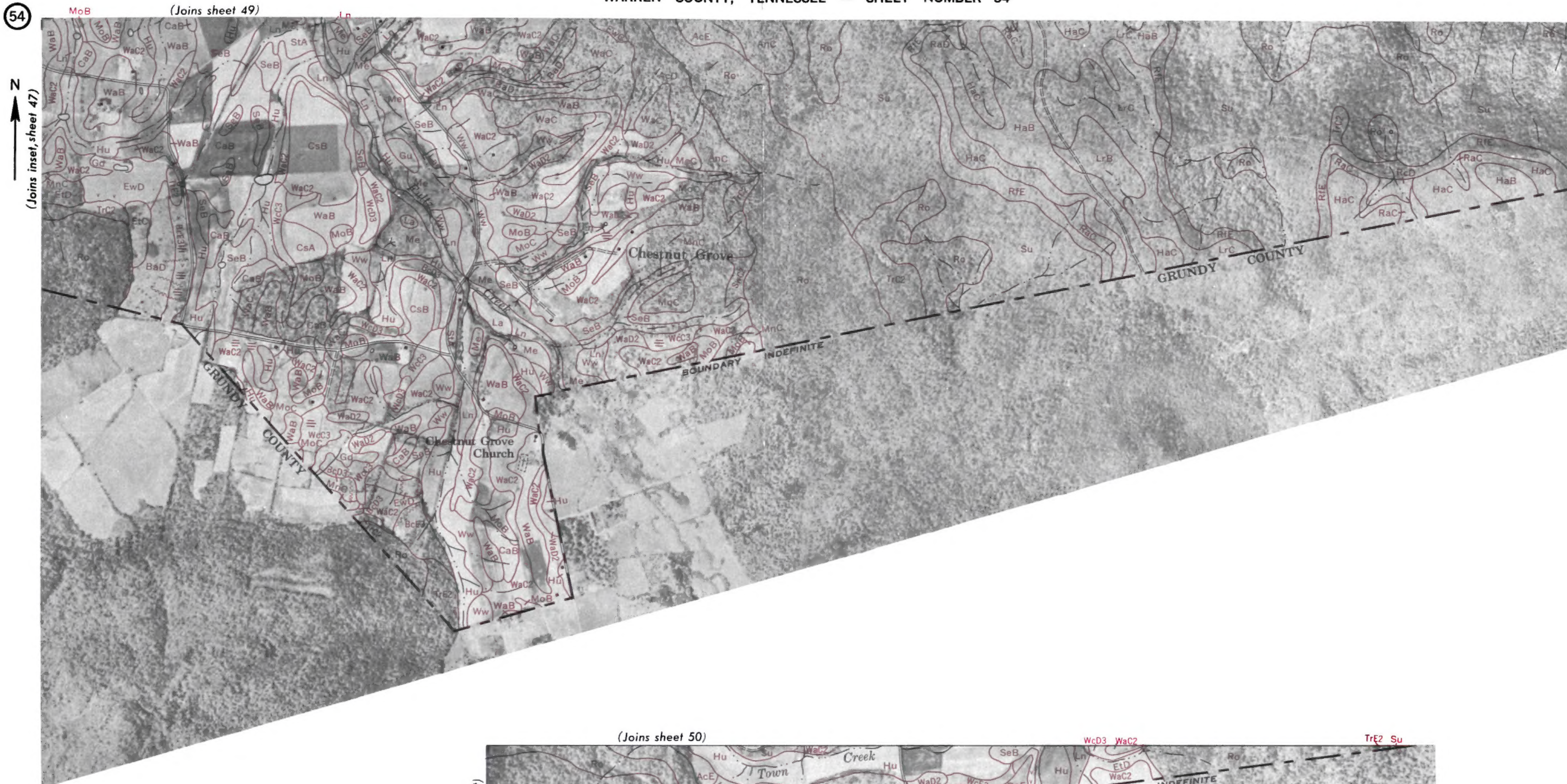
(sheet 46)

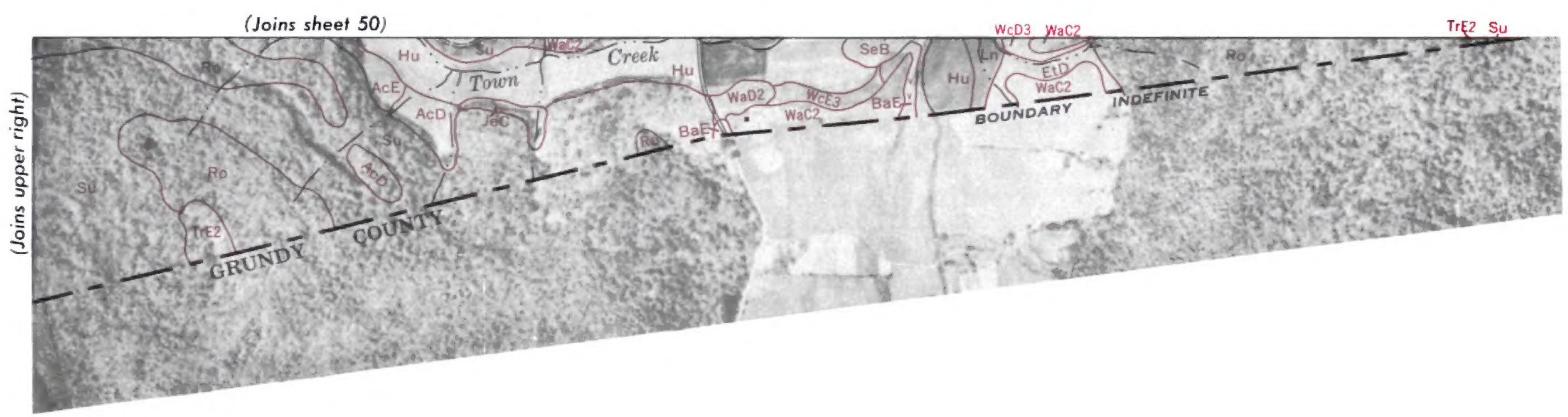
(Joins sheet 52)



This map is one of a set compiled in 1965 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Tennessee Agricultural Experiment Station.

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet





0 ½ 1 Mile Scale 1:15 840 0 5000 Feet